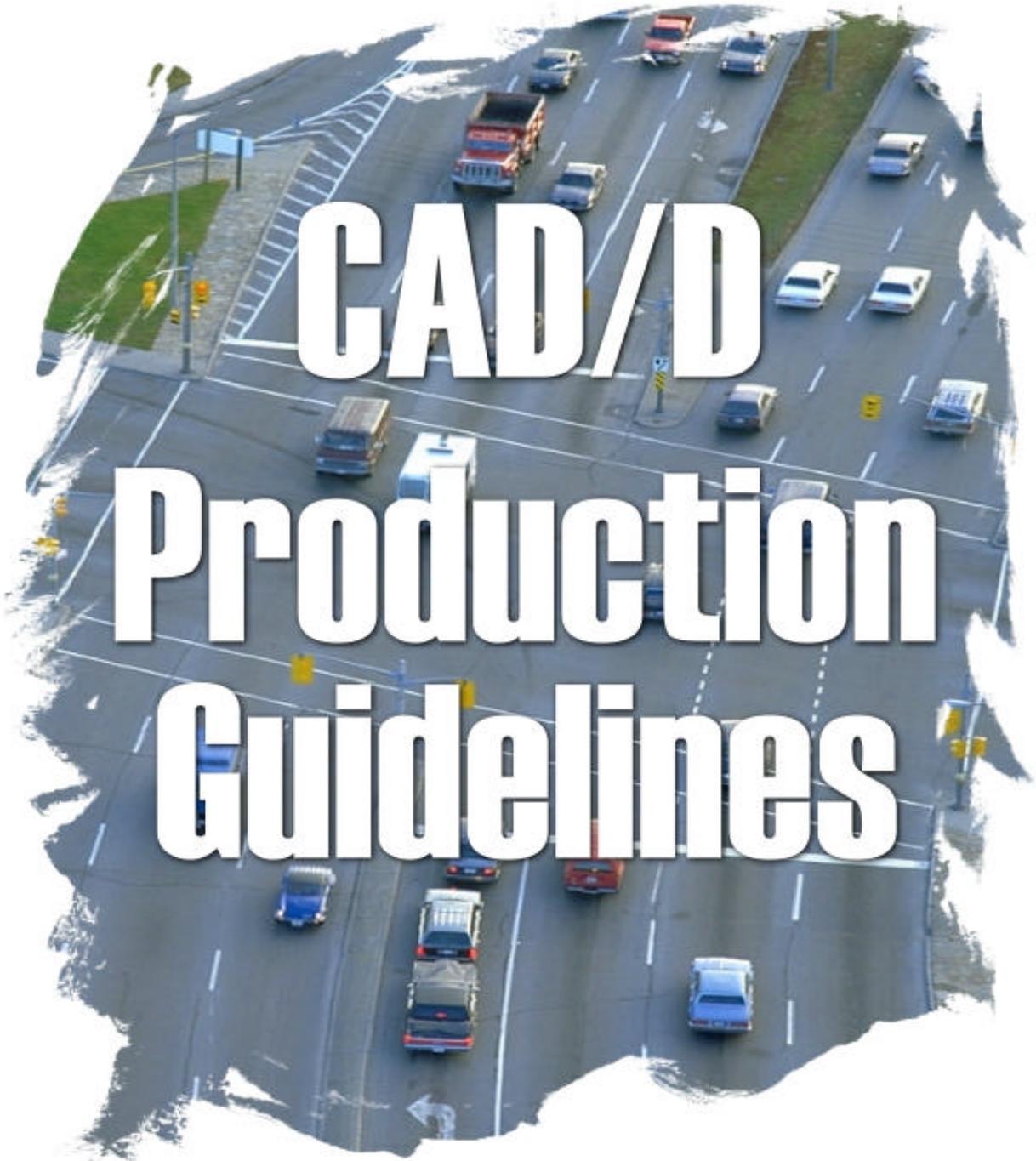




New Hampshire

Department of Transportation



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PART I

GENERAL INTRODUCTION

PART I – GENERAL INTRODUCTION

DISCLAIMER

The guidelines contained in this document are for reference only. The material contained is provided without warranty or liability of any kind to the New Hampshire Department of Transportation. Every effort has been made to make the documentation as complete and accurate as possible without errors.

This information is provided on an "as is" basis. Updates to these guidelines will be made as needed due to any errors found in the documentation, new programs, change in software, software enhancements, or as policy and management dictate.

As with any documentation or guidelines, improvements can and should be made. Any additions, suggestions or comments for improvement are encouraged. This documentation is not meant to be a complete instructional document. The intent is to provide guidelines that, if followed, will result in better quality and consistency for electronic plans and documents.

Current versions of software specific files (style libraries, fonts, naming conventions, etc.) can be found on the NHDOT CAD/D website at <http://www.state.nh.us/dot/its/cadd/cadd.html>

Any recommendation for improvement to this documentation is welcomed. Any errors found should be brought to the attention of NHDOT so corrections can be made. Any additional information or detailed explanation needed to these guidelines should be documented and mailed to:

CAD/D Section, Bureau of Information Technology Services
New Hampshire Department of Transportation
PO Box 483
Concord, NH 03302-0483

E-mail: Bureau12@dot.state.nh.us
Tel: 603-271-3281

REVISION SUMMARY

No revisions at this time.

INTRODUCTION

This document is the New Hampshire Department of Transportation's (NHDOT) specifications for required electronic (computer) data as it relates to engineering design project deliverables. In addition to the traditional hardcopy delivery items, NHDOT will require supplementary electronic data delivery items. This data will be in the formats specified by this document. In general, design data and Digital Terrain Model (DTM) data is to be provided in the MX model file or 3-D DXF file formats, and graphical data is to be provided in MicroStation's .DGN drawing format. Organizations wishing to perform professional engineering services for NHDOT are required to deliver electronic data as specified by this document. This specification also requires organizations to accept and utilize pertinent electronic input data as provided by NHDOT.

These electronic delivery items **DO NOT** replace any **hardcopy** delivery items.

The guidelines in this document represent the minimum requirements that must be met for the development of NHDOT Computer Aided Design & Drafting (CAD/D) projects. While the guidelines contained herein provide a basis for uniform CAD/D practice for NHDOT projects, precise rules that would apply to all possible situations that may arise are not possible to describe. Situations may exist where these standards will not apply. If variances from the NHDOT CAD/D Production Guidelines are necessary for a project, they must be approved in writing by the NHDOT Project Manager and documented in the Project Journal File as defined herein.

Engineering projects are expected to adhere to the standards that were in force at the time the contract was initiated. Consultants may voluntarily choose to follow a later revision.

This document is published as a complete revision to the "CAD/D SPECIFICATIONS FOR DATA TRANSFER PROCEDURES" document dated February 1995.

Trademarks

GEOPAK is a registered trademark of GEOPAK Corporation, an affiliate of Beiswenger, Hoch & Associates, Inc.

Microsoft, **Windows** and **Windows NT** are registered trademarks of Microsoft Corporation.

MicroStation, **MDL**, **InRoads** and **SelectCAD** are registered trademarks of Bentley Systems, Inc.

MX and **MXROAD** are registered trademarks of Infracore Corporation.

GENERAL INFORMATION

TRANSITION TO NEW SOFTWARE

During 1999, NHDOT began transitioning from a GDS & MOSS CAD/D system to the present MicroStation and MX system. Shortly before that the DOS/Windows 3.x environment was converted to a Windows NT Server/WorkStation operating system. As a result, all new CAD/D procedures are being developed with new documentation.

MICROSTATION LEVEL LIMITATIONS

When selecting level schemes for MicroStation, a limit of 63 levels for each design file is a current software limitation. A future enhancement to MicroStation software will enable unlimited levels in one file. When the level enhancement is released in a production version, level schemes may be modified to take advantage of the additional levels. NHDOT may make a revision to the CAD/D Production Guidelines allowing additional levels per file to be used. Until the revision, levels 1-63 shall be used.

CURRENT NHDOT SOFTWARE VERSIONS

NHDOT desires to stay current with state of the art trends in the market, however, budget constraints, statewide implementation, impact on users, and providing support for the new features must be considered prior to any change.

As NHDOT makes a change that results in modifying electronic procedures, the CAD/D Production Guidelines will be updated where necessary to reflect the change. A list of the modifications will be found in the revision summary. **As a rule, until documentation is modified, no deviation from the current dated guidelines should be considered.**

MAJOR SOFTWARE AND CURRENT PRODUCTION VERSIONS

1. MicroStation J version 07.01.01.57
2. MX version 2.5
3. Microsoft Office 2000 products

FILE FORMAT AND DELIVERY

GUIDELINES FOR SUBMITTING ELECTRONIC DATA TO NHDOT

All electronic data furnished to the NHDOT shall use the appropriate naming scheme and format for the type of data to be transmitted. It is very important to clearly communicate what is being transmitted and to describe the format of the transmitted files.

A letter is to be attached to **all submissions** stating briefly:

1. File content
2. File Format (zipped, MicroStation, MX, etc. and the utility used)
3. MX or MicroStation version (SE, J, etc.)
4. Number of diskettes, zip disks, etc.
5. Files must be in the proper format before transmitting to NHDOT. **No translating of information by NHDOT personnel shall be required.**
6. If files are zipped or backed up, a brief explanation of the recommended procedure to extract the files should be included.
7. Versions of software must be current to or fully compatible with that of the NHDOT.
8. Each disk submitted shall be labeled and dated with a minimum of the State Project # and date. If a series of disks are transmitted, the disk label shall also include the disk number and the total disks of that set, (ex: 1 of 10). Other subsequent disks shall be labeled so as to uniquely identify each group or set and shall include the sequence number followed by the total number in the group (ex: 2 of 10, 3 of 10, etc.)
9. NHDOT reserves the right to reject any file transmitted that does not conform to these guidelines.

DATA SUBMISSION

In addition to hard copy drawings specified by the contract, the consultant shall submit electronic drawing files in MicroStation .DGN file format. Electronic files shall be delivered on one of the following in order of preference:

- a) CD-ROM
- b) Zip Drive Cassette
- c) 3½" floppy disk

The final submission shall include all files necessary to reproduce the cut sheet drawings as well as copies of the original "roll-plan" drawings used to generate the cut sheets. A Project Journal File will be provided with the submission. Any drawings not included in the NHDOT standard drawing list will be identified and will include a description of levels used on each drawing.

Documentation of procedures and project history shall be maintained in a Project Journal File. An in-depth description of the Project Journal File is in *PART V – OTHER PROJECT DATA* beginning on page 39.

Detailed description of the data to be provided by NHDOT to the consultant and expected deliverables at various stages of the project's development are included in the next section.

If MicroStation tables for linestyles, multilines, level tables, symbology tables, database, special fonts, or any special user defined feature is used, that information must be provided and shall become property of NHDOT. Similarly, any MX macro, symbol, linestyle, style set, or feature set developed by the consultant and necessary to properly display the project data shall become property of NHDOT. Any MX input file developed to generate, enhance, or alter the project's design that the consultant feels would be beneficial to future designers of the project should also be provided. A name and description of each file must also be provided.

DEVIATION FROM FORMAT

Any file to be submitted that deviates from the above mentioned format must have prior NHDOT approval. The approval must be in writing with the name of the individual from NHDOT who permitted the varying format.

FILE CONVERSION

Translation tables, conversion tables, or special software programs have not been created or standardized for exchanging information between common file formats such as DXF, DWG, ICES, IGES, or software such as AutoCAD, ARCVIEW, ARCINFO, GDS, etc.

MicroStation provides methods for exchanging select file types but data is often modified during the process. The Consultant is solely responsible for any translation and verification required to convert non-MicroStation graphics files to the current NHDOT MicroStation design file format. All translated design files shall conform to the standards adopted by NHDOT for electronic plans and the specifications required in this document. Those files shall be converted to MicroStation and thoroughly reviewed prior to transmitting to NHDOT.

The consultant shall be prepared to submit a sample cut sheet, profile, typical or detail, and/or cross-section sheet for review of conformity to the NHDOT CAD/D specifications at various stages of the project's development. As a minimum, the final design consultant should be prepared to submit electronic project drawings at the Preliminary Plans, Specifications & Estimate (PPS&E) and PS&E stages of the project. Depending on the project, NHDOT may request electronic submissions at a more or less frequent interval.

UNSUPPORTED AUTOCAD FEATURES

The following AutoCAD 2000 objects were not supported in MicroStation J at the time this was written:

- RText
- Arc Aligned Text
- Wipeout
- Layouts other than the active one

Other AutoCAD features that were previously known to improperly translate to MicroStation:

- Paper Space.
- MTEXT.
- Symbol Fonts

Suggestions to improve translations:

- Use Romans or Simplex Text

- If you have to rotate the View to place text or to view a sheet that has been rotated, use DVIEW and the TWIST command.
- If possible, use Standard AutoCAD Color

MICROSTATION ONLY DELIVERABLE

Ultimately, NHDOT will only accept plan drawings that were developed in MicroStation. At that time, translations from AutoCAD or any other CAD/D software will no longer be allowed. This change is anticipated to take place during the second quarter of 2002.

PART II

NHDOT DESIGN PROCESS

PART II – NHDOT DESIGN PROCESS

This section is intended to describe the data that is to be provided when a project moves from one design phase to the next. There are two major transition points where Highway Design CAD/D data needs to be transferred: the turnover from the Plan Preparation Section to Preliminary Design and the one from Preliminary Design to Final Design.

PLAN PREPARATION

The Plan Preparation section is responsible for taking project survey and preparing the digital terrain model (DTM) and base drawings that will be used during the design process. They should also be the ones to initiate the Project Journal File described in *PART V – OTHER PROJECT DATA* beginning on page 39.

Electronic data to be provided by Plan Preparation to:

Preliminary Design and consultants using MX software:

1. Copy of the MX modelfile
2. Copy of the topo input file (TOPO.INP) containing survey data and Plan Preparation modifications/enhancements.
3. Copy of annotated MicroStation .DGN files developed for the project.
4. Copy of the Project Journal File

Consultants without MX software:

1. 3D DXF files of existing detail and triangulation generated from the MX modelfile
2. Copy of annotated MicroStation .DGN files developed for the project.
3. Copy of the Project Journal File

PRELIMINARY DESIGN

The Preliminary Design section is responsible for taking the data provided by the Plan Preparation section and designing the project up to the Public Hearing stage. This includes gathering all data necessary to prepare designs to be presented at the Public Officials Meeting, Public Informational Meetings, and Public Hearing.

Electronic deliverables expected from consultants at the completion of the Preliminary Design process:

Consultants using MX software:

1. Copy of the MX modelfile
2. Copy of any input files available to recreate the submitted design
3. Copies of any macro symbols and macro line definitions used on the project that are not included in the NHDOT standards
4. Copy of MicroStation .DGN files developed for the project
5. Copy of the Project Journal File

Consultants without MX software:

1. 3D DXF files generated from the design software used
2. Copy of project horizontal and vertical alignments in MX HALGN and VERAT formats. Examples of HALGN and VERAT data can be found on pages 83 and 85
3. Copy of MicroStation .DGN files developed for the project
4. Copy of the Project Journal File

Electronic data to be provided by Preliminary Design to:

Final Design and consultants using MX software:

1. Copy of the MX modelfile
2. Copy of the topo input file (TOPO.INP) containing survey data and Plan Preparation modifications/enhancements
3. Copy of MicroStation .DGN files developed for the project
4. Copy of the Project Journal File

Consultants without MX software:

1. 3D DXF files generated from the MX modelfile
2. Copy of MicroStation .DGN files developed for the project
3. Copy of the Project Journal File

FINAL DESIGN

The Final Design section is responsible for taking the data provided by the Preliminary Design Section or Preliminary Design Consultant and designing the project up to the Contract Plans stage. This includes refining the project design as approved at the Public Hearing, preparing a project estimate, bid documents, and obtaining necessary construction permits.

Electronic deliverables expected from a Final Design consultant at the project's completion:

All Consultants

1. Copy of MicroStation .DGN files developed for the project
2. Copy of the Project Journal File
3. COGO and coordinate reports of each alignment similar in format to the ones shown beginning on page 87.
4. Station and offset listing of proposed bounds
5. Plot files in HPGL format of each contract plan sheet

Consultants using MX software:

1. Copy of the MX model file
2. Copy of any input files available to recreate the submitted design
3. Copies of any macro symbols and macro line definitions used on the project that are not included in the NHDOT standards

Consultants without MX software:

1. 3D DXF files generated from the design software used
2. Copy of project horizontal and vertical alignments in MX HALGN and VERAT formats. Examples of HALGN and VERAT data can be found on pages 83 and 85
3. If the project was designed with InRoads/SelectCAD, include files mentioned below

PROJECTS DESIGNED USING INROADS/SELECTCAD

If a project is designed with InRoads/SelectCAD the following files should be delivered with other project data:

Surface Files (*.dtm): These files contain the existing and proposed ground information. In Version 7.x of InRoads they contain just the "triangulation". In the newest version of InRoads (SelectCAD) these files store the "triangulation" and other data. They will contain element types, i.e. edge of pavement, wetlands, buildings, and random shots.

Alignment Files (*.alg): These files contain the Horizontal, Vertical, and Superelevation information for a project.

Template Library (*.tml): These files contain the templates, Material Tables, Cut/Fill Tables, and Decision Tables used to create the proposed design. Decision Tables work basically the same as an interface macro. Templates are similar to MX templates.

Roadway Library (*.rwl): These files tell InRoads how to apply the templates and decision tables.

Preference Files (*.prf or *.ini): In Version 7.x of InRoads these files control the display of design information in InRoads; how InRoads draws profiles, sections, alignments, and design data. If SelectCAD is used then *civil.ini* and *wysiwyg.ini* preferences should be provided. These two files control how all information is displayed in SelectCAD (These files are very similar to the .prf files).

Custom Cross Section files (*.xsc): These files contain a list of stations and offsets for InRoads to display sections. They will contain constant intervals, special stations, and skewed sections.

SPECIALIZED DEVELOPMENT BY DESIGN CONSULTANTS

Any specialized programs, macros, utilities, symbology, etc., developed by the consultant that are necessary to properly display drawings submitted to NHDOT shall be included with other project deliverables.

Submission of copies of other specialized programs, macros, utilities, symbology, etc. developed to improve MicroStation and MX drafting and design processes is encouraged. It is understood that NHDOT accepts these items without any guarantee of usefulness or expectations of support by the developer. In addition, NHDOT will not distribute these items to any other individual, consultant or State Transportation Department without prior permission of the developer.

PART III

MICROSTATION

PART III – MICROSTATION

FILE NAMING

An attempt shall be made to have electronic files named using only an eight character file name with a .DGN extension. However, it is understood that this will not always be possible or preferable. Only alpha or numeric characters with no spaces or special characters shall be used.

Project sheet file names are composed of four parts; the project number (first five fields), sheet designator (“s”), sheet number (last two fields), and the file extension. The five digit key number of the project is assigned by NHDOT. The letter “s” identifies the drawing as an individual sheet instead of full project plan. The sheet number is a consecutive listing of the sheets for the project. The extension is always “.DGN”. The eight views within the sheet files are used to display the different types of plans. The suggested views are set up as shown in the table below. Modifications to this format will be noted in the Project Journal File.

View Number	Plan Type
1	General Plan
2	Drainage & Utility
3	Pavement & Curbs
4	Right-of-Way
5	Wetlands
6	User Defined
7	User Defined
8	User Defined

Realizing that there are a number of different ways to accomplish this same task, variations to the method described above may be acceptable with prior approval of NHDOT. Consultants wishing to use an alternative method should contact the project manager to arrange a meeting with the CAD/D development staff.

Project “roll-plan” file names are composed of three parts; the project number (first five fields), drawing type (last three fields), and the .DGN file extension.

A further explanation of standard naming conventions and drawing type designators used by NHDOT is contained in *APPENDIX A - MICROSTATION DRAWING NAMES* beginning on page 47.

LEVEL ASSIGNMENTS AND SYMBOLOGY

Elements used to construct CAD/D drawings shall be placed on the appropriate design file levels as assigned in *APPENDIX B - LEVEL MAPPING CONVENTION* beginning on page 49. Standard plan sheet symbols are illustrated in volume 2 of the NHDOT Design Manual on the Standard Symbol drawing. Line weights, styles and text height shall conform with the sample drawings shown in volume 2 of the NHDOT Design Manual. Use of NHDOT-defined MicroStation line styles is preferred. Symbols which are needed to complete project plans that are not covered in the NHDOT Design Manual or contained in NHDOT cell libraries may be created by the consultant with the approval of the Project Engineer. Resource files containing any linestyles and/or symbols created by the consultant for use on the project drawings will be provided to NHDOT.

Actual symbols for use with MicroStation software, including standard borders, are contained in NHDOT's standard cell libraries and are available in MicroStation .CEL file format. A standard color table, standard metric & Imperial line style resource files with NHDOT line styles and font library with NHDOT fonts for use with MicroStation are available. This data is available on the NHDOT website or can be requested through the Project Manager. The website address is listed in the Disclaimer section at the beginning of this document.

Level naming files contain names and group definitions for MicroStation .DGNs. For Highway Design use there are level naming files available for most detail drawings. These files have the same 3 character name as the drawing with an .LVL extension. For example, the level naming file for drawing *12345ex3.dgn* will be *ex3.lvl*.

There are two .LVL files to be utilized when creating .DGNs for the Bureau of Bridge Design. The first file is called *brc.lvl*, and stands for BRidge Cut-sheet. It contains the names required to accurately place graphical elements on a cut sheet (also referred to as a detail sheet). The second file, called *brd.lvl*, contains the names required to place graphical elements in a .DGN at project coordinates. Many of the names in *brd.lvl* are required in order to transfer elements to MX For MicroStation. If information is not going to be passed from MicroStation into MX, several of the layers will remain vacant.

SEED FILES

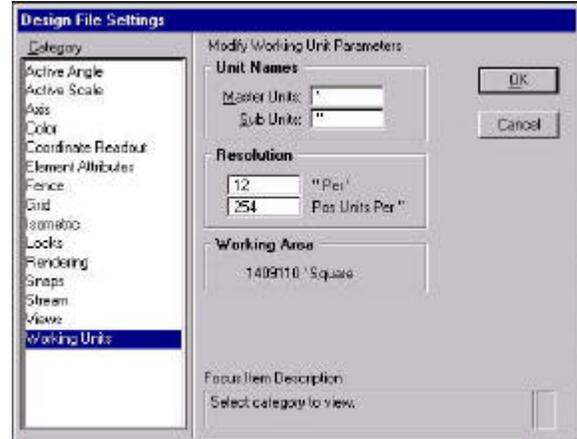
MicroStation uses "seed" files to create all design files. These seed files are templates in which standard parameters are set according to what is needed to begin drafting for a specific type of work in accordance with NHDOT standards. The seed file defines the working units for the file, global origin, view attributes, default color table, text settings, coordinate readout and several other important parameters. NHDOT supplies seed files for both metric and Imperial drawings. Seed files allow the user to begin work in a standard format and maintain uniformity.

Two of the most important settings in the seed file are the working units and global origin. Working units are expressed as master units and fractional sub-units. The number of positional units per sub-unit is called the working resolution. The working resolution determines the precision to which elements are drawn and the size of the design plane. The design cannot exceed the working area. Because the size of the design plane is dependent on the precision as established by the working units defined in a file, the working units must allow the required precision without limiting the coordinate range of the design plane.

The format for the working units in MicroStation is defined as MU:SU:PU (master units, sub-units, positional units). The NHDOT seed file working units are defined below:

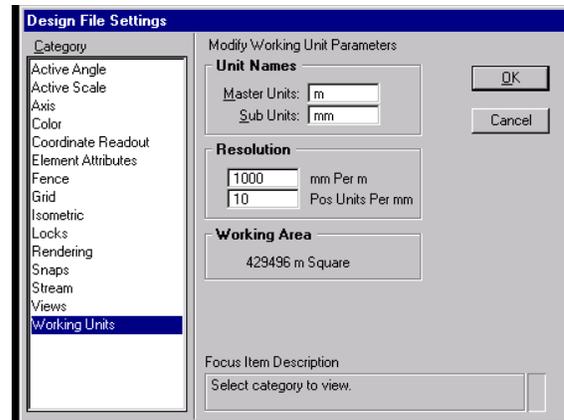
IMPERIAL 3D SEED FILE (NHSEEDFT.DGN)

Working Units:
 Master Units = ft
 Sub-Units = inches
 Positional Units = 254/inch
 Global Origin: X= 500
 Y= 500
 Z= 10,000



METRIC 3D SEED FILE (NHSEEDM.DGN)

Working Units:
 Master Units = m
 Sub-Units = mm
 Positional Units = 10/mm
 Global Origin: X= 500
 Y= 500
 Z= 10,000



The global origin has been set at 500, 500, 10000 for both metric and Imperial files. Using these coordinates, the seed files can be used for both drawings based at State Plane Coordinates and drawings, such as cross-sections, profiles, typicals and special details, using a local coordinate base. The 10,000 in the z-plane allows MX data with null elevations to be transferred properly.

To reset the global origin for a drawing file, enter the key-in GO=-500,-500,-10000 and use the right mouse button to issue a "reset" command.

REFERENCE FILE ATTACHMENTS

A reference file is a MicroStation design file or a raster image attached as a background file to an active design file, thus allowing several design groups to share the same information without the need to copy the file(s). MicroStation can attach a reference file by one of three different ways:

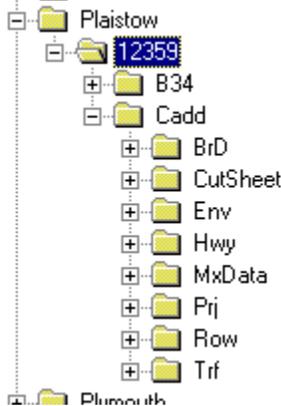
1. Name only – the path to the referenced file is resolved by the MicroStation configuration variable MS_RFDIR.
2. Full path – the reference file name and directory path is saved within the master file.
3. URL address – the file is attached in the form of a URL address using relative paths.

In order for a project to be delivered to NHDOT in an electronic format that will allow future use of the files for printing purposes without modification to the files, the reference files must be attached in a way that will allow MicroStation to resolve the reference file attachment paths regardless of the drive or parent

directory of the project. Option 1 above is the preferred method for NHDOT projects, since it allows the files to be moved from drive to drive without losing the reference file attachments. However, this option requires the MicroStation configuration variable, MS_RFDIR, be set for all NHDOT projects.

DIRECTORY STRUCTURE

The standard directory structure being used for CAD/D projects within NHDOT is shown below:



CAD/D files are stored in directories under the Cadd folder. Files that need to be used with MX are stored in the Prj folder. The other folders will contain files that are only pertinent to that particular bureau.

BrD – Bridge Design
 Env – Environment
 Hwy – Highway Design
 Row – Right of Way
 Trf – Traffic

The CutSheet folder is where final contract plan DGN files will be stored. MXData is used to store miscellaneous MX files.

TEXT STYLES

MicroStation font resource files are binary files created from font cells, TrueType, Postscript, or AutoCAD shape fonts. MicroStation will read multiple font resource files according to the paths set by the MS_SYMBRSC configuration variable in the selected workspace. However, within MicroStation they are compiled into a list of all the fonts from all the resource files that were found. If one file contains a font with the same number assigned as another font resource file, the user will see the last one located. A font resource file can contain 256 fonts.

The NHDOT font resource files are called *nh-custom-font.rsc* & *nhttfont.rsc*. Any fonts within the NHDOT resource files that are no longer in use will be maintained for backward compatibility purposes. The fonts contained within the NHDOT resource files are described below. Font numbers below 170 are reserved for standard MicroStation fonts.

NHTTFONT.RSC

Font	Description
170	True Type font Arial
171	True Type font Arial Bold
173	True Type font Courier
174	True Type font Courier Bold
176	True Type font Times New Roman
177	True Type font Times New Roman Bold
182	True Type font Comic Sans
183	True Type font Comic Sans Bold

NH-CUSTOM-FONT.RSC

Font	Description
180	Nh_engineering (engineering w/bridge and drafting symbols)

TEXT SIZE AND SPACING

Standard text sizes and fonts have been defined to ensure uniformity and legibility on all CAD/D drawings. The correct text size is dependent on the plot scale. Since, the most important issue with text is that it should be legible, font and text size may vary as necessary. Text line spacing should be, on average, the same as the text height. The following table of text sizes for plans at a given scale is to be used as a guideline for the existing, new, and maximum text size:

STANDARD TEXT SIZES

Imperial Text

Imperial Scale	1"=1"	1/4"=1'	1"=20'	1"=50'	1"=100'
Existing	0.007	0.320	1.600	4.000	8.000
New	0.008	0.400	2.000	5.000	10.000
Maximum	0.012	0.560	2.800	7.000	14.000

Metric (SI) Text

Metric Scale	1:1	1:100	1:250	1:400	1:500	1:1000
Existing	0.002	0.200	0.500	0.800	1.000	2.000
New	0.0025	0.250	0.625	1.000	1.250	2.500
Maximum	0.0035	0.350	0.875	1.400	1.750	3.500

LINE STYLES

Line style is part of the symbology of graphical elements in MicroStation. An element can be set to the standard MicroStation line styles (numbered 0 - 7) or to a custom line style defined in a custom line style resource file. Custom line styles are user definable resource files for the display of different patterns, for example a tree line, fence line, guardrail, etc. When an element is drawn in MicroStation with a custom line style, the definition of the line style is not contained within the design file. The resource file from which it was selected must be packaged with the design file and it must be found by MicroStation's configuration in order to properly display the line. Therefore, users are strongly discouraged from creating their own custom line styles. Use the NHDOT supplied custom line style resources.

NHDOT CUSTOM LINE STYLE RESOURCE FILES

Standard NHDOT Custom line style files	
<u>Imperial</u>	<u>Metric</u>
line-ft.rsc	line-m.rsc
pipe-ft.rsc	pipe-m.rsc

As mentioned above, custom line styles are user definable in MicroStation. Styles for plan drawings have been created for use on a 1:500 scale (1"=50') drawing. Linestyles that are not defined to be a specific width (such as pipe and railroad styles) need to be scaled to display properly on other scale plan drawings. Linestyles used on 1:250-scale metric drawings should be scaled by 0.5 and those used on 1"=20' Imperial drawings should be scaled by 0.4. These settings will be included in the settings manager files.

Caution must be exercised as the definition for the line style is maintained in a resource file and a design file only contains links to custom line style resource files. If a new (non-standard) custom linestyle is developed by a user, those resource files must be delivered with the project. Users shall not modify the NHDOT delivered standard custom line style files.

CUSTOM LINSTYLE SCALING CHARTS

Metric

Scale for plotting	Custom linestyle scale setting
1:1	500
1:2	250
1:5	100
1:10	50
1:20	25
1:25	20
1:50	10
1:100	5
1:250	2
1:500	1

Imperial

Scale for plotting	Ratio	Custom linestyle scale setting
1"=1"	1:1	600
6"=1'	1:2	300
3"=1'	1:4	150
2"=1'	1:6	100
1 1/2"=1'	1:8	75
1"=1'	1:12	50
3/4"=1'	1:16	37.5
1/2"=1'	1:24	25
3/8"=1'	1:32	18.75
1/4"=1'	1:48	12.5
3/16"=1'	1:64	9.375
1/8"=1'	1:96	6.25
1"=10'	1:120	5
3/32"=1'	1:128	4.6875
1/16"=1'	1:192	3.125
1"=20'	1:240	2.5
1"=50'	1:600	1

The following list of custom linestyles do not require scaling. The lines are created with a true size assigned.

BmGrDbL	CurbRt	Railroad
BmGrLt	PCurbLt	TrafBarls
BmGrRt	PCurbRt	XPipeE#
CblGrLt	Pavemark	XPipeP#
CblGrRt	PipeE#	
CurbLt	PipeP#	

The names are the same for both metric and Imperial except the numbers on the pipe linestyles.

NOTES

The *line-ft.rsc* and *line-m.rsc* files contain custom line styles called ARROW-BR. This line should be used to connect the note text to the graphic. In order for the arrowhead of the ARROW-BR line to be properly proportioned, the user must enter the proper scale in the Line Styles dialog box for custom line styles before placing the line.

COLOR TABLE

A standard color table is necessary to provide visual consistency thus allowing users to easily identify elements in shared files and for consistency in color plotting. NHDOT has its own default color table. The table defines 256 colors from which an active color can be selected and applied to an element.

CELL FILES

The following graphic cell files have been created for use on NHDOT projects.

br_2bral.cel	2 bar aluminum bridge rail and approach rail details
br_3bral.cel	3 bar aluminum bridge rail and approach rail details
br_bgr.cel	beam guardrail and end section details
br_bore.cel	boring sheet symbols
br_brush.cel	2 bar aluminum approach rail with brush curb
br_curb.cel	granite bridge curb, type A & B bituminous curb, & Jersey barrier
br_exrai.cel	existing rail details
br_misc.cel	borders, state seal, state outline, rip-rap, slope lines, waterstops, sheet piles
br_pile.cel	HP sections and Pile Key
br_scee.cel	protective screening
br_t2pl2.cel	t2 rail, approach rail, and safety fence details
br_t4pl2.cel	t4 rail and approach rail details
br_weld.cel	weld symbols
drainage.cel	proposed drainage detail cells
environ.cel	environmental detail cells
exist-in.cel	existing topography cells
grdrail.cel	proposed guardrail detail cells
pavemark.cel	proposed pavement marking detail cells
row.cel	proposed right-of-way detail cells
signals.cel	of proposed signalization detail cells
signs.cel	proposed sign detail cells
titles.cel	miscellaneous plan sheet cells
utility.cel	proposed utility detail cells
xsect.cel	cross-section detail cells

The following pattern cell file has been created for use on NHDOT projects.

Nhpatern.cel	Hearing plan removal patterns
--------------	-------------------------------

SETTINGS MANAGER

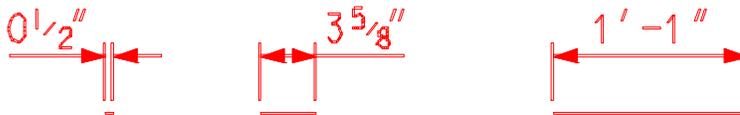
NHDOT is developing settings manager files to be used in-house to aid in drafting the contract plans. Copies of these files are available to consultants on the NHDOT website. Four files are currently available.

File	Use
nhdot500.stg	500-scale metric
nhdot250.stg	250-scale metric
nhdot50.stg	50-scale Imperial
nhdot20.stg	20-scale Imperial

Several of the groups in Setting’s Manager are prefixed with “BRD”, “Bridge”, or “BRD & Bridge”. Components labeled “BRD” are for use in the .DGN containing the bridge at project coordinates. Components labeled “Bridge” are for use in the detail sheets. Components labeled “BRD & Bridge” are for use in all Bridge Design drawings. It should be noted that components in the group labeled “Bridge – Exist, Substr, Rebar” are to be used on detail sheets for placing graphics representing all existing objects (e.g. an existing abutment or girder), proposed substructure, and proposed rebar.

DIMENSIONING

The dimensions for bridge detail drawings shall be placed to have the appearance of those which follow:



The use of Settings Manager is strongly encouraged for the placement of all dimensions, since, at a minimum, it will select the proper text size. It is understood that in order to achieve the dimension appearances shown above, the Settings Manager defaults will, at times, need to be overridden. The Dimension Settings, as set by Settings Manager, that will most frequently require adjustment are as follows:

Placement	- Location	Default = Semi-Auto
Terminators	- Orientation of Terminators	Default = Automatic
Terminators	- Geometry – Minimum Leader	Default = 2

CROSS-SECTION DRAWINGS

NHDOT has decided to store MicroStation cross-sections in one or more files each containing a number of cross-sections. This method is compatible with MX and allows for a smaller number of DGN files to be created for the project. A border cell is placed around each sheet-size portion of the drawing and plotted using a batch plot option that plots all instances of a specified cell.

Realizing that there are a number of different ways to accomplish this same task, variations to the method described above may be acceptable with prior approval. Consultants wishing to use an alternative method should contact the project manager to arrange a meeting with the CAD/D development staff.

DETAIL SHEETS

A single detail sheet frequently requires the placement of several details of various scales. To accomplish this, all details shall be drawn at a scale of 1:1 while using the NHDOT standard working units defined within the NHDOT seed files. The detail sheet shall be composed by applying scale factors to the self-referenced attachments of the detail drawing. The border of the detail sheet shall be a cell placed on the drawing at a scale of 1. Detail drawings shall not be created by either increasing the scale of the border or by temporarily adjusting the working units of the file, in any way.

PLOTTING

The plotter driver file (file extension .PLT) is used to set default plotter settings. Style records used within NHDOT .PLT files are taken directly from the Bentley supplied *hpgl2.plt* file. Black and white plot drivers have been modified to force all pen colors to black except pens 10-14 which are defined as various shades of gray in the NHDOT color table. The following lines have been added to black and white plot drivers:

```
;plot colors 1-9,15-254 black  
pen(1)=(1-9,15-254)/rgb(0,0,0)
```

The following lines replaced the lines in the Bentley supplied black and white plot drivers:

```
; units for weight stroke are multiples of .025 mm  
weight_strokes=(3,8,13,18,25,30,35,40,45,50,55,60,65,70,75,80,85,90,95,100,105,110,115,120,125,130,135,140,145,150,155,160)
```

CREATING HPGL2 FILES

To create HPGL2 files for project submissions, select the Bentley supplied *hpgl2.plt* driver. Print each cut sheet. Plot files should be named with the convention for plan sheets outlined on page 19 using a .HPGL2 file extension.

PART IV

MX

PART IV – MX

FILE NAMING

MX files should be named in such a way that someone unfamiliar with the project can figure out what the file is for. MX projects are typically given names beginning with the town name followed by the state project number. For example: *Concord 12345.mmd*. Other file types are listed in the table below.

Type	Extension	Description
Input	.INP	Used to store line mode commands to create or modify MX strings
Output	.PRN	Used to store the results of an input file or interactive commands
Draw	.DRW	An input file that is used to create a display using a drawing macro or major option DRAW and/or ENHANCE commands
Journal	.JOU	A journal file stores commands issued during an MX session so they can rerun at a later time

MODEL NAMING

Suggested MX model names are listed in Appendix C, on page 67. Any variations from this convention shall be noted in the project journal file.

STRING LABELING

MX data is contained in strings and the strings are contained in models. Each string has a unique four-character label. Typically the first two characters of the string label are used to identify the type of string. NHDOT will continue to use the existing survey detail string labeling convention that was implemented with MOSS (the VMS version of MX). The existing detail string labeling convention is shown in Appendices D & E on pages 71 (topical listing) and 77 (alphabetical listing).

STYLE SETS

A style set is a collection of styles which is used to draw a complete model or a selected part of it in plan view.

NHDOT DEVELOPED STYLE SETS FOR MX DRAWINGS

ali.pss	Used to draw alignment detail.
topo.pss	Used to draw existing survey detail.
ply.pss	Used to draw proposed roadway designs.

STYLE SETS USED TO CREATE MICROSTATION DRAWINGS

ali.pss	Used to draw alignment detail.
ex1.pss, ex2.pss, ex3.pss, exu.pss	Used to create the four existing detail DPW's that will become MicroStation base detail drawings.
ply.pss	Used to draw proposed roadway designs.

FEATURE SETS

Feature sets are a means of grouping strings and identifying them with a description. They are used throughout MX to make it easier to select strings for subsequent operations. The strings belonging to a feature set are specified using a partial string name, and are drawn with a style set (usually having the same name as the feature set). For plan drawings, NHDOT uses a single feature set, *nhdot.fns*, that is a combination of the individual feature sets available for each MX style set.

DRAWING MACROS

In addition to the style and feature sets mentioned above, MX users can also draw detail and sections with drawing macros. A number of these macros have been developed and are available for download from the NHDOT website

CROSS-SECTION SETTINGS FILES

Cross sections and profiles can be generated in a number of different ways. Using the cross-section wizard within MX allows the user to save parameters defining the cross-section set. These saved settings

files have a .CSU extension and are stored in the project directory. The settings file will define the type of sections cut (based on the cross-section feature set used), models selected, and information about any special stations or skewed sections.

MACRO SYMBOLS & LINES

Symbols for use with MX software, including standard line patterning symbols, are available in the MX .MMS and .MML file formats. Since line and symbol size is defined in the MX style sets, the same line and symbol definitions are used for both metric and Imperial projects. This data is available on the NHDOT website or can be requested through the Project Manager.

PART V

OTHER PROJECT DATA

PART V – OTHER PROJECT DATA

PROJECT JOURNAL FILES

PROJECT JOURNAL GUIDELINES

A Project Journal will be produced and delivered with each electronic project plan submission. The purpose for this journal is to aid downstream customers of the CAD/D data so they may utilize existing CAD/D work in their processes. The format of the journal will be an electronic file, either in text format or a format supported by Microsoft Word 2000. As a minimum, the journal will contain the following information:

- A listing (Index) of the files delivered, including brief descriptions of each file and where the file is located.
- Documentation about the CAD/D software used, special CAD/D decisions made, exceptions to standards that were made, problems encountered and work around, or other important issues that arose during the course of the CAD/D work. For example, if a custom line style needed to be created, the justification, resource file, and files where that line style was used would be documented in the Journal. Other documentation such as the design software used, particular software settings, and other information that would help a downstream user of the data understand where and how the data was created should be documented.

NHDOT has not established a specific format for the Journal file. The sample file shown on the following pages should be used as a guideline for the type of information to be included and format that is expected.

Important data that should also be contained in the Journal include:

- All information necessary for the regeneration or use of those files by subsequent customers of the CAD/D data
- Document the design data, controlling alignment and profile names and geometry input/output files, relevant survey information, cross sections and the methodology used to obtain the final geometric controls in the CAD/D product.

The project journal must be kept up to date as the CAD/D design work progresses and be delivered with the project on the preferred media for archival purposes.

EXAMPLE OF CAD/D PROJECT JOURNAL

CAD/D PROJECT JOURNAL

(nhdotproject_index.doc)
4/13/00

PROJECT JOURNAL

This file contains information about the project 12345 and the corresponding electronic files contained in the **project directory**. This file should be kept up to date and archived with the project's electronic files. When filling in the required information, please delete the instructions and examples in order to maintain a concise record.

PROJECT DESCRIPTION

State Project Number: 12345
Federal Aid Number: N/A
County: Merrimack
Project Manager: Project Manager
Project Designer: Project Designer
Project Directory: M:\pbt\town\12345\cadd\prj

SCOPE OF WORK

The scope of work for project 12345 goes here. Include as much detail as necessary to define the work done for the project.

PROJECT FILES

List any drawing files that do not fit into the standard naming convention. Include a brief description of the data contained in each one.

MICROSTATION FILE INFORMATION

Non-Standard Drawings

List any drawings that are not on the standard naming convention list with a brief description of each one's contents.

Plot Information

List information about batch plot specifications, pen tables, or other features used to generate the plot files.

MX FILE INFORMATION (or information for other design programs used)

MX Topo input file: topo.inp

Preliminary Design Engineer: Your Name

Final Design Team Leader: Team Leader

<u>MX Design Input File Names</u>	<u>Description</u>
pdesign-mc0m.inp	The file that creates the alignment MCOM and design strings up to and including the interface stage.
psectmc0m.inp	Creates the old ground and proposed cross-sections for alignment MCOM

TEXT FILES

Include information about output files, genio files, or other ASCII files provided with the project drawings.

SPECIAL INFORMATION/COMMENTS

This job was designed with MX version 2.4a. We had problems getting some cross-sections working, so we estimated the earthwork in that area (123+00 to 125+00). When job was completed, there was a design change that affected cross sections. Earthwork was minimal so we did not recalculate earthwork in the area of 195+00 to 202+00.

Cross Section Info (Main Line)

Existing Cross Sections

Master Alignment Model: PALIGN
 Master Alignment Name: .MC1M
 Description: Main St. (NH 100)
 Triangle String: TRIA
 Cross Section Model: PDESIGN MC1M SECTIONS
 Cross Section Label: E

Proposed Cross Sections

Design Model: PDESIGN MC1M
 Master Alignment Name: .MC1M
 Description: Main St. (NH 100)
 Triangle String: TRIA

Cross Section Model:PDESIGN MC1M SECTIONS
Cross Section Label:D

Cross Section Info (Side Road)

Description:Main St. (NH 100)
Master Alignment Model: PDESIGN MC1M
Master Alignment Name: .MC1M
Cross Section Model:PDESIGN MC1M SECTIONS

Existing Cross Sections

Triangle Model: TRIANGLES
Triangle String: TRIA
Cross Section Label: E

Proposed Cross Sections

Cross Section Label:D
Mask File:..... l.msk

Additional Section Sets

Cross Section Label: X
Description:Existing ground feature labels

Cross Section Label: A
Description:Sections of Side Road cut from Main St. alignment

DRAWING QUALITY ASSURANCE / QUALITY CONTROL

To aid the consultant and in-house staff in developing a set of contract plans that conform to the requirements contained in this document, NHDOT is looking to purchase QA/QC software that works with MicroStation drawings. This software will work from a set of "rule" files based on the established MicroStation standards. It is the intent of NHDOT to distribute a read-only version of this software, at no cost, to consultants with active NHDOT projects to be used to check the drawings before they are submitted.

When the software has been selected, details will be included in this document.

Part VI
Appendix

PART VI - APPENDIX

APPENDIX A - MICROSTATION DRAWING NAMES

MicroStation drawing names will begin with the project number. The tables below show 3 character codes that will follow the project number.

For example: 12345ALI.DGN would contain alignment data for project 12345.

BRIDGE DESIGN DRAWINGS

AAM	Abutment A Masonry	BXR	Box Wing Reinforcing	FWB	Frame Wings B
AAR	Abutment A Reinforcement	BXW	Box Walls	GLD	Girder Layout and Details
ABM	Abutment B Masonry	DEV	Developed Views	GNP	Genplan
ABR	Abutment B Reinforcement	DRE	Deck Reinforcing	P1M	Pier 1 Masonry
AW1	Abutment A Wings 1	DXS	Deck Section	P1R	Pier 1 Reinforcement
AW2	Abutment A Wings 2	FAM	Footing A Masonry	P2M	Pier 2 Masonry
BDT	Box Details	FAR	Footing A Reinforcement	P2R	Pier 2 Reinforcement
BOR	Borings	FBM	Footing B Masonry	PCD	Precast Deck
BRD	Proposed Bridge	FBR	Footing B Reinforcement	PGP	Preliminary Genplan
BRQ	Boring Request	FDD	Frame Deck Details	PSP	Preliminary Site Plan
BW1	Abutment B Wings 1	FFA	Frame Footing A	STP	Siteplan
BW2	Abutment B Wings 2	FFB	Frame Footing B		
BXD	Box Deck	FLA	Frame Leg A		
BXF	Box Footing	FLB	Frame Leg B		
BXM	Box Wings Masonry	FRA	Framing Plan		
		FRD	Frame Deck		
		FWA	Frame Wings A		

HIGHWAY DESIGN DRAWINGS

ALI	Alignment	EXF	Field check data	PSN	Proposed signing
BRD	Bridge	EXU	Existing utilities	PUT	Proposed utilities
CTR	Existing Contours	HER	Hearing plan	PWT	Proposed wetlands
ENV	Environment	P##	Profile	ROW	Right-of-way
EX1	Existing roadway features	PGR	Proposed guard-rail	S##	Cut sheet
EX2	Existing manmade features	PLY	Proposed layout	TYP	Typicals
EX3	Misc. existing details	PNT	Proposed notes	X##	Cross-section
		PPM	Proposed pavement markings	WET	Wetlands
		PSG	Proposed signalization		

APPENDIX B - LEVEL MAPPING CONVENTION

Note: This data was correct at the time it was published. It is likely to have changed since then and is included primarily for reference purposes. The latest mapping convention can be found on the NHDOT web-site at the address listed at the beginning of this document..

DRAWING: **ALI** **ALIGNMENT**

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Construction Elements	63						
Curve data	60		Cyan(5)				
Detour alignment	20	MC B	Cyan(5)			MS 0 lw=3	
Detour curve data	22		Cyan(5)			MS 0 lw=3	
Detour stationing	21		Cyan(5)			MS 0 lw=3	
Driveway alignment	40	MC D	Cyan(5)			MS 0 lw=3	
Driveway stationing	41		Cyan(5)			MS 0 lw=3	
Mainline alignment	4	MC M	Cyan(5)			MS 0 lw=3	
Mainline curve data	6		Cyan(5)			MS 0 lw=3	
Mainline stationing	5		Cyan(5)			MS 0 lw=3	
North Arrow	61		Cyan(5)				
Preliminary alignment	30	MC P	Cyan(5)			MS 0 lw=3	
Preliminary curve data	32		Cyan(5)			MS 0 lw=3	
Preliminary stationing	31		Cyan(5)			MS 0 lw=3	
Railroad alignment	50	MC T	Cyan(5)				
Railroad stationing	51		Cyan(5)				
Ramp alignment	15	MC R	Cyan(5)			MS 0 lw=3	
Ramp curve data	17		Cyan(5)			MS 0 lw=3	
Ramp stationing	16		Cyan(5)			MS 0 lw=3	
Secondary alignment	7	MC A	Cyan(5)			MS 0 lw=3	
Secondary curve data	9		Cyan(5)			MS 0 lw=3	
Secondary stationing	8		Cyan(5)			MS 0 lw=3	
Survey alignment	2	MC S	Pink(199)			MS 0 lw=3	
Survey stationing	3		Pink(199)			MS 0 lw=3	
Survey traverse string	10	PSSA	Red (2)				

DRAWING: BRC BRIDGE CUT SHEETS

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Approach Slab	49		Red(2)			MS 0 lw=3	
Border	1			borders	BDRBR1		
Boring (from M&R)	5		Red(2)				
Bridge Rail	15		LtBlue(9)			MS 0 lw=3	
Bridge Shoe	50		Red(2)			MS 0 lw=3	
CL Brg	33		Cyan(5)			MS 4 lw=1	
CL Girders	32		Cyan(5)			MS 4 lw=1	
ConstrChord&WorkLine	34		Cyan(5)			MS 4 lw=1	
Construction elements	63		Purple(200)			MS 0 lw=3	
DeckCurb&Sidewalk	42		MintGreen(122)			MS 0 lw=3	
DiaphragmsKFrameUtilitySupports	52		Red(2)			MS 0 lw=3	
Dimensions	56		Green(56)			MS 0 lw=1	
Excavation Pay Limit	36		Red(2)			MS 1 lw=3	
Exist Substr(ftg.abut,wing,pier)	10		Goldenrod(36)			MS 0 lw=1	
Existing Br Deck(deck,curb,sw)	9		Goldenrod(36)			MS 0 lw=1	
Existing Girder System	11		Goldenrod(36)			MS 0 lw=1	
Existing Misc Details	13		Goldenrod(36)			MS 0 lw=1	
Existing Stone Fill	14		Goldenrod(36)			MS 0 lw=1	
Existing Utilities	12		Goldenrod(36)			MS 0 lw=1	
Expansion Jt&CurbPlates	43		MintGreen(122)			MS 0 lw=3	
Fill 1 (10,20,50%)	6		Grey(12,13,14)			MS 0 lw=1	
Fill 2 (10,20,50%)	7		Grey(12,13,14)			MS 0 lw=1	
Ftgs,Abut,&Wings	41		Red(2)			MS 0 lw=3	
Girder	51		Red(2)			MS 0 lw=3	
Hatch 1,2 (45D,135D)	8		Red(2)			MS 0 lw=1	
North Arrow	61		Cyan(5)	br_misc	NOARRO		
Piles	38		Red(2)			MS 0 lw=3	
Proposed Stone and Fill	37		Red(2)			MS 0 lw=3	
Reinforcing Steel 1	53		LtBlue(9)			MS 0 lw=3	
Reinforcing Steel 2	54		LtBlue(9)			MS 0 lw=3	
Reinforcing Steel 3	55		LtBlue(9)			MS 0 lw=3	
Scuppers&Downspouts	44		MintGreen(122)			MS 0 lw=3	
Temporary Bridge	21		Marigold(52)			MS 0 lw=3	
Temporary Works	20		Marigold(52)			SheetPile lw=3	
Title Box Varying	60		LtOrange(67)			lw=1	
TitleBoxUnchanging	59		LtOrange(67)			lw=1	

DRAWING: BRD PROPOSED BRIDGE

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Abutment Site	39	TB	Green(3)			MS 0 lw=3	
Approach Rail	16		LtBlue(9)			MS 0 lw=3	
Approach Slab	49		Red(2)			MS 0 lw=3	
Bike Rail	19		LtBlue(9)			MS 0 lw=3	
Boring Layout	4		Red(2)	br_bore	BORSYM		
Bottom of Abutment	40	BB	Red(2)			MS 0 lw=3	
Bridge Deck	42	BG	MintGreen(122)			MS 0 lw=3	
Bridge Rail	15		LtBlue(9)			MS 0 lw=3	
Bridge Shoe	50		Red(2)			MS 0 lw=3	
CL Brg	33		Cyan(5)			MS 4 lw=1	
CL Girders	32		Cyan(5)			MS 4 lw=1	
Construction Chord	34		Cyan(5)			MS 4 lw=1	
Construction elements	63		Purple(200)				
Curb Bottom	12	EB	MintGreen(122)			MS 0 lw=3	
Curb Top	13	ET	MintGreen(122)			MS 0 lw=3	
Diaphragm	52		Red(2)			MS 0 lw=3	
Dimensions	56		Green(56)				
Excavation Limit LT	35	IL	Green(3)			CutLt lw=1	
Excavation Limit RT	36	IR	Green(3)			CutRt lw=1	
Expansion Joint	43	EJ	MintGreen(122)			MS 0 lw=3	
Fill 1 (10,20,50%)	6		Grey(12,13,14)			MS 0 lw=1	
Fill 2 (10,20,50%)	7		Grey(12,13,14)			MS 0 lw=1	
Fill slope	37	IF	Green(3)			Fill lw=1	
Footing Bottom	44	BF	Red(2)			MS 0 lw=3	
Footing Top	45	TF	Red(2)			MS 0 lw=3	
Gen & Site Text (Both)	1		Red(2)				
Gen Plan Slope Line	28		Red(2)	br_misc	SLOPGS		
Gen Plan Stone Limits	30		Red(2)			MS 0 lw=3	
General Plan (Only) Text	2		LtBlue(9)				
Girder	51		Red(2)			MS 0 lw=3	
Hatch 1,2 (45D,135D)	8		Red(2)			MS 0 lw=1	
North Arrow	61		Cyan(5)				
Pier Top	46	TP	Red(2)			MS 0 lw=3	
Piles	38		Red(2)			MS 0 lw=3	
Primary Contours	24		Yellow(6)			MS 0 lw=0	
Secondary Contours	25		Grey(10)			MS 1 lw=0	
Show Only in Site	22		Green(3)			MS 0 lw=3	
Sidewalk	14	EX	MintGreen(122)			MS 0 lw=3	
Site Plan (Only) Text	3		Green(3)				
Site Plan Slope Line	29		Green(3)	br_misc	SLOPSI		
Site Plan Stone Limits	31		Green(3)			MS 0 lw=3	
Temporary Bridge	21		Marigold(52)			MS 0 lw=3	
Temporary Works	20		Marigold(52)			SheetPile lw=3	
Top of Abutment	41	TB	Red(2)			MS 0 lw=3	
Wing Bottom	47	WW	Red(2)			MS 0 lw=3	
Wing Top	48	WT	Red(2)			MS 0 lw=3	

DRAWING: CTR CONTOURS

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Index	49		Brown(161)				
Intermediate	50		Brown(161)				

DRAWING: DET DETOUR

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Beam gr rt	52	BR	Green(105)				
Bridge Rail	50		Green(105)				
Catch Basin	34	PCBD	Green(105)		PPCBD		
Controller Cabinet	3	PCCT	Green(105)		PPCCT		
Curb Bottom	12	EB	Green(105)			MS 0 lw=2	
Curb Top	13	ET	Green(105)				
Cut Slope Lt	57	IL	Green(105)			CutLt	
Cut Slope Rt	58	IR	Green(105)			CutRt	
Detour Notes	62		Green(105)				
Detour Signs	40		Green(105)				
Ditch Line	32	DL					
Double faced rail	51	DF	Green(105)				
Drainage manhole	37	PMHD	Green(105)		PPMHD		
Drainage Notes	48		Green(105)				
Drainage pipe	20	DP	Green(105)				
Driveway	16	DR	Green(105)			MS 0 lw=3	
Drop Inlet	36	PDID	Green(105)		PPDID		
Fill slope	59	IF	Green(105)			Fill	
Guard Rail Notes	49		Green(105)				
Handhole	4	PHHL	Green(105)		PPHHL		
Header	26	TH	Green(105)				
Jersey barrier	54	JB	Green(105)				
Mast arm pole	15	PMAP	Green(105)		PPMAP		
Metal End Section	27						
Meter Post	7	PMTR	Green(105)		PPMTR		
Other fence	17	FO	Green(105)			Fence-Nobarb	
P Roadway	11	CE	Green(105)			MS 0 lw=2	
P Shoulder	10	ES	Green(105)			MS 0 lw=3	
Pavement Markings	43		Green(105)				
Pedestrian Rail	55		Green(105)				
Pullbox	8	PPBX	Green(105)		PPPBX		
Rigid End Section	28						
Shoreline	46		Green(105)				
Sidewalk	14	SK	Green(105)				
Signalization Notes	47		Green(105)				
Slope Points	60		Green(105)				
Stone Lining	31	RP	Blue(4)				
Stream	45		Green(105)				
Street Light Conduit	5						
Terminal Unit	53		Green(105)				
Utility Junction Box	6	PJCT	Green(105)		PPJCT		

DRAWING: ENV ENVIRONMENT

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Construction Elements	63						
Delineated wetland	20	WD	Cyan(5)				Wetland
Flood legend	11		Purple(214)				
Flood Lines	10		Purple(214)				
Historic district bndy	1		Red(2)				
Historic property bndy	2		Red(2)				
Historic structure label	3		Red(2)				
Swamp symbol	22	PSWP	Cyan(5)	Environ	EPSWPV		
Wetland Delin Labels	21		Cyan(5)				
Wetland Impact Labels	24		Lt. Blue(110)				
Wetland Impact Summary Chart	26		Lt. Blue(110)				
Wetland Impacts	23		Lt. Blue(110)				
Wetland Legend	25		Lt. Blue(110)				

DRAWING: EX1 EX. ROADWAY FEATURES

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Barbed wire fence	26	FB	Grey(10)			Fence-Ba lw=1	
Beam gr lt	20	BL	Grey(10)			BmGrLt lw=1	
Beam gr rt	21	BR	Grey(10)			BmGrRt lw=1	
Bench mark	50	PBMK	White(15)	Existin	EPBMK	lw=1	
Bottom of Abutment	40	BB	Red(2)			MS 0 lw=1	
Bottom of slope	33	BS0	Grey(10)			-	
Bound Other	51	PCON	White(15)	Existin	EPCON	lw=1	
Bridge deck	42	BG	Red(2)			MS 0 lw=1	
Cable gr lt	23	GL	Grey(10)			CblGrLt lw=1	
Cable gr rt	24	GR	Grey(10)			CblGrRt lw=1	
Center of road	2	CO	Red(2)			MS 5 lw=1	
Construction Elements	63						
Curb Left	12	CL	Grey(10)			CurbLt lw=1	
Curb Right	13	CR	Grey(10)			CurbRt lw=1	
Curb Top	14	TC	Grey(10)			MS 5 lw=1	
Ditch line	16	DL	Cyan(5)			MS 0 lw=1	
Double faced rail	22	DF	Grey(10)			BmGrDbl lw=1	
Drill hole	49	PDHL	White(15)	Existin	EPDHL	lw=1	
Driveway	17	DR	Orange(81)			MS 5 lw=1	
Edge of pavement	10	EP	Yellow(6)			MS 5 lw=1	
Existing Roadway	11	TW	Yellow(6)			MS 5 lw=1	
Expansion joint	43	EJ	Red(2)			MS 0 lw=1	
Exposed footing Top	45	TF	Red(2)			MS 0 lw=1	
Footing Bottom	44	BF	Red(2)			MS 0 lw=1	
Iron pin	53	PIPN	White(15)	Existin	EIPIN	lw=1	
Jersey barrier	25	JB	Grey(10)			MS 5 lw=1	
NH Bound	52	PBND	White(15)	Existin	EPBND	lw=1	
Other fence	27	FO	Grey(10)			Fence-No lw=1	
Pier Top	46	TP	Red(2)			MS 0 lw=1	
Project marker	54	PRJM	White(15)	Existin	EPRJM	lw=1	
Ret wall lt	28	RWL	Grey(10)			RetWallL lw=1	
Ret wall rt	29	RWR	Grey(10)			RetWallR lw=1	
Ret wall top	30	TR	Grey(10)			-	
Ridge line	34	RD	Grey(10)			-MS 5 lw=1	
Right-of-way bound	55	PROW	Cyan(5)				
Sidewalk	15	SK	Lt. Purple(9)			MS 5 lw=1	
Spot elevations	3	PELV	Red(2)				
State line marker	56	PSLM	Red(2)	Existin	EPSLM	lw=1	
Stone wall	31	SW	Grey(10)			StoneWal lw=1	
Top of Abutment	41	TB	Red(2)			MS 0 lw=1	
Top of slope	32	TS	Grey(10)			-	
Town line marker	58	PTLM	Red(2)	Existin	EPTLM	lw=1	
Trail	18	TL	Brown(34)			MS 5 lw=1	
Wing Bottom	47	WW	Red(2)			MS 0 lw=1	
Wing Top	48	WT	Red(2)			MS 0 lw=1	

DRAWING: EX2 EX. MANMADE FEATURES

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Berm	40	BM	Green(3)			MS 0 lw=1	
Concrete Pad	50	CP	Grey(10)			MS 0 lw=1	
Construction Elements	63						
Controller Cabinet	3	PCCT	Lt. Purple(9)	Existin	EPCCT	lw=1	
Dam	41	DM	Cyan(5)			MS 0 lw=1	
Dam - bottom	42	DB	Cyan(5)			MS 0 lw=1	
Double post sign	14	PSND	Lt. Purple(9)	Existin	EPSND	lw=1	
Flag pole	18	PFPL	Grey(10)	Existin	EPFPL	lw=1	
Fuel Tank	54	PFTK	Yellow(6)			lw=1	
Gas pump	49	PGAS	Orange			lw=1	
Gas pumps	51	GP	Yellow(6)	Existin		MS 0 lw=1	
Gate	36	GA	Grey(10)			MS 0 lw=1	
Gate post	19	PGPT	Grey(10)			lw=1	
Ground or yard light	20	PGLT	Red(2)	Existin	EPGLT	lw=1	
Handhole	4	PHHL	Lt. Purple(9)	Existin	EPHHL	lw=1	
Lamp post or priv light	21	PLPT	Red(2)	Existin	EPLPT	lw=1	
Lane markings	5	LM	Lt. Purple(9)			MS 5 lw=1	
Large sign	13	SN	Lt. Purple(9)			MS 0 lw=1	
Lawn features	22	ORN	Grey(10)			MS 0 lw=1	
Leachfield	23	LF	Green(3)			MS 5 lw=1	
Loop detector	6	SLD	Lt. Purple(9)			MS 5 lw=1	
Magnetic detector sleeve	7	DS	Lt. Purple(9)				
Mail box	24	PMBX	Grey(10)	Existin	EPMBX	lw=1	
Miscellaneous features	25	FM	Grey(10)			MS 5 lw=1	
Miscellaneous points	26	PMDF	Grey(10)			lw=1	
Monuments as features	27		Grey(10)			MS 0 lw=1	
Monuments or statues	28	PMON	Grey(10)			lw=1	
Parking meter	17	PARK	Grey(10)	Existin	EPARK	lw=1	
Pool	29	QP	Cyan(5)			MS 0 lw=1	
Post - all types	30	PPST	White(15)	Existin	EPPST	lw=1	
Pullbox	8	PPBX	Lt. Purple(9)	Existin	EPPBX	lw=1	
Railroad details	60		Black(1)			Railroad	
Ramp - Boat; etc.	43	RM	Cyan(5)			MS 0 lw=1	
Satellite dish	32	PDAT	Grey(10)	Existin	EPDAT	lw=1	
Septic Tank	33	PSTK	Green(3)	Existin	EPSTK	lw=1	
Signal conduit	9	SC	Lt. Purple(9)			ConduitS	
Single post sign	15	PSGN	Lt. Purple(9)	Existin	EPSGN	lw=1	
Sluiceway	44	SU	Cyan(5)			MS 0 lw=1	
Stockpile/lumber pile	34	QS	Brown(161)			MS 0 lw=1	
Storage tank fill cap	52	PSTT	Yellow(6)			lw=1	
Storage tanks	53	SG	Yellow(6)			MS 0 lw=1	
Street light conduit	10	LC	Red(2)			ConduitL	
Traffic Signal	16	PSGL	Lt. Purple(9)	Existin	EPSGL	lw=1	
Utility Junction Box	2	PJCT	Red(2)	Existin	EPJCT	lw=1	
Vent pipe - Outlet	35	PVNT	Green(3)	Existin	EPVNT	lw=1	
Well	45	PWEL	Cyan(5)	Existin	EPWEL	lw=1	

DRAWING: EX3 MISC. EXISTING DETAILS

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Athletic Field	50	AF	Green(3)			MS 0 lw=1	
Boring	2	PBOR	Red(2)			lw=1	
Boulder	40	PBDR	Grey(10)	Existin	EPBDR	lw=1	
Building	25	BD	Red(2)			MS 0 lw=1	
Building sill	27	BE	Red(2)			MS 0 lw=1	
Bush	5	PBUS	Green(3)	Existin	EPBUS	lw=1	
Cemetery	51	CM	Grey(10)			MS 5 lw=1	
Coniferous tree	9	PTCS	Green(3)	Existin	EPTCS	lw=1	
Construction Elements	63						
Deciduous tree	10	PTDS	Green(3)	Existin	EPTDS	lw=1	
Delineated wetland	21	WD	Blue(4)			Wetland (ST) lw=1	
Fire tower	53	PFTR	Grey(10)			lw=1	
Flow arrow	19		Cyan(5)	Existin	RIVFLO		
Foundation	26	FD	Red(2)			MS 5 lw=1	
Gravestone	52	PGRV	Grey(10)	Existin	EPGRV	lw=1	
Hedge	6	HE	Green(3)			Hedge lw=1	
High water mark	15	HW	Cyan(5)			MS 5 lw=1	
Meter Post	13	PMTR	Lt. Purple(9)	Existin	EPMTR		
Orchard	7	OR	Green(3)			MS 0 lw=1	
Pedestrian signal	30	PEDS	Purple(212)	Existin	EPEDS		
Pedestrian signal pole	32	PEDP	Purple(212)	Existin	EPEDP		
Rock outcrop	42	RO	Grey(10)			MS 5 lw=1	
Shore right	18	SR	Cyan(5)			StreamRt lw=1	
Shoreline	17	SL	Cyan(5)			StreamLt lw=1	
Steps	28	SP	Red(2)			MS 0 lw=1	
Stone Lining	41	RP	Grey(10)			MS 5 lw=1	
Stream	16	ST	Cyan(5)			Ditch (ST) lw=1	
Stump	8	PSTP	Green(3)	Existin	EPSTP	lw=1	
Swamp symbol	22	PSWP	Cyan(5)	Existin	EPSWP	lw=1	
Waterfall	20	WF	Cyan(5)			(ST) lw=1	
Wet area	23	WA	Cyan(5)			(ST) lw=1	
Woods left	11	WL	Green(3)			WoodsLt lw=1	
Woods right	12	WR	Green(3)			WoodsRt lw=1	

DRAWING: EXF FIELD CHECK

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
house/drive text	25		Red(2)				
pole text	17		Red(2)				
road name	11		White(15)				
sign text	15		Lt. Purple(9)				
tree text	10		Green(3)				

DRAWING: EXU EXIST. UTILITIES & DRAINAGE

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Catch Basin	34	PCBD	Blue(4)	Existin	EPCBD	lw=1	
Catch basin/Drop inlet sump	35		Blue(4)				
Construction Elements	63						
Culvert end - Bottom	33		Blue(4)				
Drainage manhole	37	PMHD	Blue(4)	Existin	EPMHD	lw=1	
Drainage pipe	30	DP	Blue(4)			DrainPip lw=1	
Drop Inlet	36	PDID	Blue(4)	Existin	EPDID	lw=1	
Electric manhole	38	PMHE	Red(2)	Existin	EPMHE	lw=1	
Fire hydrant	44	PHYD	Blue(4)	Existin	EPHYD	lw=1	
Gas manhole	39	PMHG	Yellow(6)	Existin	EPMHG	lw=1	
Gas shutoff	45	PGSO	Yellow(6)	Existin	EPGSO	lw=1	
Guy pole or stub	10	PGUY	Red(2)	Existin	EPGUY	lw=1	
Guy wire anchors	9	PANC	Red(2)			lw=1	
Header	32	TH	Blue(4)			MS 0 lw=1	
Joint power and tel	11	PJNT	Red(2)	Existin	EPJNT	lw=1	
Light on joint pole	12	PLTJ	Red(2)	Existin	EPLTJ	lw=1	
Light on power pole	13	PLTP	Red(2)	Existin	EPLTP	lw=1	
Light pole	14	PLIT	Red(2)	Existin	EPLIT	lw=1	
Mast arm pole	15	PMAP	Orange(81)	Existin	EPMAP	lw=1	
Pole	17	PPOL	Red(2)	Existin	EPPOL	lw=1	
Power pole	18	PPWR	Red(2)	Existin	EPPWR	lw=1	
Public telephone	22	PBTH	Orange(81)	Existin	EPBTH	lw=1	
Railroad	25	RR	Grey(10)			Railroad lw=1	
Railroad sign	26	PRSN	Grey(10)	Existin	EPRSN	lw=1	
Railroad signal	27	PRSL	Grey(10)	Existin	EPRSL	lw=1	
Railroad switchstand	28	PRSW	Grey(10)			lw=1	
Sewer manhole	40	PMHS	Green(3)	Existin	EPMHS	lw=1	
Span wire pole	19	PSPA	Red(2)	Existin	EPSPA	lw=1	
Telephone manhole	41	PMHT	Orange(81)	Existin	EPMHT	lw=1	
Telephone pole	20	PTEL	Orange(81)	Existin	EPTEL	lw=1	
Transmission line tower	21		Red(2)				
Underdrain	31	UD	Blue(4)			UnderDra lw=1	
Underground Cable TV	55	UV	Orange(81)				
Underground Electric	50	UE	Red(2)			Electric lw=1	
Underground Fire alarm	51	UF	Orange(81)				
Underground Gas	52	UG	Yellow(6)			Gas-Exist lw=1	
Underground Sewer	53	US	Green(3)			Sewer-Exist lw=1	
Underground Telephone	54	UT	Orange(81)			Tele-Exist lw=1	
Underground Water	56	UW	Blue(4)			Water-Exist lw=1	
Water gate	46	PWGT	Blue(4)	Existin	EPWGT	lw=1	
Water manhole	42	PMHW	Blue(4)	Existin	EPMHW	lw=1	
Water shutoff	47	PWSO	Blue(4)	Existin	EPWSO	lw=1	

DRAWING: HER HEARING PLAN

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Alignment	4		Cyan(5)				
Bridge Structure	49		Gray(168)			Filled	
Building	25	BD	Red(2)			Fade	
Building to be removed	26		Red/Blk/White			Hatched	
Construction Elements	63						
County line	57		Red(2)			Solid	
Driveway	17	DR	Grey(0)			Filled	
Edge of traveled way	11	EP	Gray(0)			Filled	
Ex National Forest bdy	55		Red(2)			Solid	
Existing CAROW	21		Green(3)			Dashed	
Existing easement	23		Orange(81)			Dashed	
Existing LAROW	22		Red(2)			Dashed	
Existing Roadway	10	TW	Gray(0)			Filled	
Legend	1		White(15)				
Owners	8		White(15)				
P Driveway	47		Orange(81)			Filled	
P Island	44		Green(154)			Filled	
P Roadway	40	CE	Yellow(6)			Filled	
P Shoulder	41	ES	Brown(161)			Filled	
P Sidewalk	45		Lt. Purple(9)			Filled	
P Water	48		Blue(94)			Fade	
Permanent Easements	36		Orange(81)			Solid	
Property line	7	BP	White(15)			Dashed	
Proposed CAROW	29		Green(3)			Solid	
Proposed LAROW	30		Red(2)			Solid	
Pvt to be removed	12		Gray(0)/Green(53)			Hatched	
Right-of-way	20		Blue(94)			Dashed	
Right-of-way	28		Blue(94)			Solid	
Shore right	18	SR	Blue(94)			Fade	
Shoreline	18	SL	Blue(94)			Fade	
Sidewalk	15		Gray(0)			Filled	
Slope	46		Green(53)			Filled	
Small stream	18	ST	Blue(94)			Fade	
State line	56		Red(2)			Solid	
Stations	5		Cyan(5)				
Stone fill	32		White(15)			StoneFill	
Structure to be removed(bridge)	13		Gray(0)/Blue(94)			Hatched	
Takes	39		Orange(81)			Solid	
Temporary Easements	35		Orange(81)			Solid	
Town line	58		Red(2)			Solid	
Wetland	19		Blue(94)			Hatched	
Woods left	9	WL	Green(3)			Fade	
Woods right	9	WR	Green(3)			Fade	

DRAWING: MTH MATCH LINES

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Common Text	10						
Match Lines	26		250			MS 0, lw=2	
View Text	1						
View Text	2						
View Text	3						
View Text	4						
View Text	5						
View Text	6						
View Text	7						
View Text	8						

DRAWING: PDR PROPOSED DRAINAGE

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Catch Basin	34	PCBD	Blue(4)	Drainage	PPCBD	lw=3	
Construction Elements	63						
Ditch line	32	DL	Blue(4)			Ditch lw=3	
Drainage high point	10	HP	Blue(4)	Drainage	PHP		
Drainage manhole	37	PMHD	Blue(4)	Drainage	PPMHD	lw=3	
Drainage notes	48		Blue(4)				
Drainage pipe	20	DP	Blue(4)			Drain Pipe lw=3	
Drop Inlet	36	PDID	Blue(4)	Drainage	PPDID	lw=3	
Header	26	TH	Blue(4)			MS 0, lw=3	
Metal end section	27		Blue(4)				
Rigid end section	28		Blue(4)				
Sluiceway	30	SU	Blue(4)			MS 0, lw=3	
Small Stream	45	ST	Blue(94)			Ditch lw=3	
Stone Lining	31	RP	Blue(4)			Stone Fill lw=3	
Underdrain	21	UD	Blue(4)			Under Drain lw=3	

DRAWING: PGR PROP. GUARD-RAIL

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Beam gr lt	16	BL	White(15)			BmGrLt	
Beam gr rt	15	BR	White(15)			BmGrRt	
Bike Rail	20						
Boulder	40	PBDR	Grey(10)	GrdRail	PPBDR		
Bridge approach rail	13		White(15)				
Construction Elements	63						
Double faced rail	14	DF	White(15)			BmGrDbl	
Guard rail note	49		White(15)				
Jersey barrier	18	JB	White(15)				
Pedestrian rail	19		White(15)			PedRail	
Terminal unit	17		White(15)				

DRAWING: PLY PROP. LAYOUT

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Barbed wire fence	26	FB	White(15)			Fence-Barb lw=3	
Clearing line	38		Green(3)			MS 0 lw=3	
Construction Elements	63						
Curb Bottom	12	EB	White(15)			MS 0 lw=3	
Curb Top	13	ET	White(15)			CurbRt,CurbLt	
Cut Slope Lt	35	IL	Green(53)			CutLt lw=3	
Cut Slope Rt	36	IR	Green(53)			CutRt lw=3	
Driveway	16	DR	Orange(81)			MS 0 lw=3	
Edge of Lane	9	EL	Yellow(6)			ms 0 lw=3	
Fill slope	37	IF	Green(53)			Fill lw=3	
Gate	41	GA	White(15)			MS 0 lw=3	
Island - Painted	21	TI	Green(154)			MS 0 lw=3	
Island -Curbed	20	TT	Green(154)			MS 0 lw=3	
Misc Notes	56		Red(2)				
Other fence lw=3	27	FO	White(15)			Fence-Nobarb	
P Roadway	11	CE	White(15)			MS 0 lw=3	
P Shoulder	10	ES	Yellow(6)			MS 0 lw=3	
Ret wall lt	28	RWL	White(15)			RetWallLt lw=3	
Ret wall rt	29	RWR	White(15)			RetWallRt lw=3	
Ret wall top	30	RWT	White(15)			-	
Sidewalk	14	EX	Lt. Purple(9)			lw=3	
Slope points	60		Pink(252)				From SLOPWRK
Stream	45	ST	Blue(94)			Ditch lw=3	
Trail	17	TR	Brown(161)			MS 0 lw=3	
Wet area	47	WA	Blue(94)			Stream Rt lw=3	

DRAWING: PNT PROP. NOTES

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Boring notes	49		Red(2)				
Bridge notes	50		Red(2)				
Const. notes (beg/end proj/appro	51		Pink(183)				
Construction Elements	63						
Curb note	52		White(15)				
Demo note	53		Red(2)				
Drive note	54		Orange(81)				
Fence note	55		White(15)				
Misc. note	56		Red(2)				
Offset note (curb)	57		White(15)				
ROW notes	58		Blue(94)				
Slope note	59		Green(53)				
Taper note	60		Yellow(6)				
Traffic notes	61		Purple(212)				

DRAWING: PRO PROFILES

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Construction Elements	63						
Existing	1		Cyan(5)				
Grid text	47		Brown (16)				
Major grid	45						
Minor grid	46						
Proposed	2		Yellow(6)				
Subgrade	3						
Survey Detail	10						
Titles & notes	50		White(15)				
Topo Annotation	11						

DRAWING: PSG PROP. SIGNALIZATION

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Construction Elements	63						
Controller Cabinet	3	PCCT	Purple(212)	Signals	PPCCT		
Handhole	4	PHHL	Purple(212)	Signals/Utility	PPHHL		
Lane markings	5	LM	Purple(212)				
Loop detector	6	LD	Purple(212)				
Magnetic detector sleeve	7	DS	Purple(212)				MagDetSleeve lw=3
Mast arm pole	15	PMAP	Purple(212)	Signals	PPMAP		
Mast arm pole	40	PMAP	Purple(212)				
Meter Post	13	PMTR	Purple(212)	Signals	PPMTR		
Pedestrian signal	30	PEDS	Purple(212)	Signals	PPEDS		
Pedestrian signal pole	32	PEDP	Purple(212)	Signals	PPEDP		
Preemption (OPTICOM)	31		Purple(212)	Signals	POPT		
Pullbox	8	PPBX	Purple(212)	Signals/Utility	PPPBX		
Signal conduit	9	SC	Purple(212)				ConduitS lw=3
Signal head	33	PHED	Purple(212)	Signals	PPHED		
Signalization notes	47		Purple(212)				
Street light conduit	10		Red(2)				ConduitL lw=3
Strobe	34		Purple(212)	Signals	PSTROB		
Traffic Signal	16	PSGL	Purple(212)	Signals	PPSGL		
Utility Junction Box	2	PJCT	Red(2)	Signals	PPJCT		

DRAWING: PSN PROP. SIGNING

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Const. signs (G20)	30		Purple(212)				
Construction Elements	63						
Construction signs	21		Orange(81)				
Detour signs	20		White(15)				
Double post sign	14	PSND	Purple(212)	Signs	PPSND		
New signs	50		Purple(212)				
Regulatory signs	22		Red(2)				
Single post sign	15	PSGN	Purple(212)	Signs	PPSGN		
Warning signs	23		Yellow(6)				

DRAWING: PUT PROP. UTILITIES

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Construction Elements	63						
Electric manhole	38	PMHE	Red(2)	Utility	PPMHE		
Fire hydrant	44	PHYD	Blue(4)	Utility	PPHYD		
Gas manhole	39	PMHG	Yellow(6)	Utility	PPMHG		
Gas shutoff	45	PGSO	Yellow(6)	Utility	PPGSO	3	
Guy pole or stub	10	PGUY	Red(2)	Utility	PPGUY		
Joint power and tel	11	PJNT	Red(2)	Utility	PPJNT		
Light on joint pole	12	PLTJ	Red(2)	Utility	PPLTJ		
Light on power pole	13	PLTP	Red(2)	Utility	PPLTP		
Light pole	14	PLIT	Red(2)	Utility	PPLIT		
Light w/ 12' bracket	15		Red(2)	Utility	PNLIT		
Pole	17	PPOL	Red(2)	Utility	PPPOL		
Power pole	18	PPWR	Red(2)	Utility	PPPWR		
Railroad signal	27	PRSL	White(15)	Utility	PPRSL		
Sewer manhole	40	PMHS	Green(3)	Utility	PPMHS		
Span wire pole	19	PSPA	Red(2)	Utility	PPSPA		
Telephone manhole	41	PMHT	Orange(81)	Utility	PPMHT		
Telephone/telegraph pole	20	PTEL	Orange(81)	Utility	PPTEL		
Transmission line tower	21		Red(2)				
Underground Cable TV	55	UV	Orange(81)				
Underground Electric	50	UE	Red(2)				
Underground Fire alarm	51	UF	Orange(81)				
Underground Gas	52	UG	Yellow(6)				
Underground Sewer	53	US	Green(3)				
Underground Telephone	54	UT	Orange(81)				
Underground Water	56	UW	Blue(4)				
Utility Junction Box	2	PJCT	Red(2)	Utility	PPJCT		
Utility note	60		White(15)				
Utility pole note	49		Red(2)				
Water gate	46	PWGT	Blue(4)	Utility	PPWGT	3	
Water manhole	42	PMHW	Blue(4)	Utility	PPMHW		
Water shutoff	47	PWSO	Blue(4)	Utility	PPWSO	3	

DRAWING: PVM PAVEMENT MARKINGS

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Construction Elements	63						
Dual left turn arrows	17		Lt. Purple(9)	Existin	ETWLTL		
Dual left turn arrows	27		Purple(212)	PaveMark	PTWLTL		
Edge of lane	29	EL	Purple(212)			MS 0 lw=3	
Edge of pavement	30	ES	Purple(212)			MS 0 lw=3	
Edge of travelled way	31	CE	Purple(212)			MS 0 lw=3	
Left turn arrow	11		Lt. Purple(9)	Existin	EARWL		
Left turn arrow	21		Purple(212)	PaveMark	PARWL		
Left/through/right arrows	15		Lt. Purple(9)	Existin	EARLTR		
Left/through/right turn arrows	25		Purple(212)	PaveMark	PARLTR		
Only(word)	16		Lt. Purple(9)	Existin	EONLY		
Only(word)	26		Purple(212)	PaveMark	PONLY		
Painted island	40	TI	Purple(212)			MS 0 lw=3	
Right turn arrow	12		Lt. Purple(9)	Existin	EARWR		
Right turn arrow	22		Purple(212)	PaveMark	PARWR		
Through arrow	10		Lt. Purple(9)	Existin	EARWT		
Through arrow	20		Purple(212)	PaveMark	PARWT		
Through/left turn arrows	13		Lt. Purple(9)	Existin	EARWTL		
Through/left turn arrows	23		Purple(212)	PaveMark	PARWTL		
Through/right turn arrows	14		Lt. Purple(9)	Existin	EARWTR		
Through/right turn arrows	24		Purple(212)	PaveMark	PARWTR		

DRAWING: PWT PROP. WET

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Area DW	1		Blue(4)				
Area IMP	3		Blue(4)				
Area NHWB	2		Blue(4)				
Construction Elements	63						
Wetland chart	4		Blue(4)				

DRAWING: ROW RIGHT-OF-WAY

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Bound text	51		White(15)				
Construction Elements	63						
County line	57	BC	Red(2)			CountyLine	
Ex National Forest bdy	55	BN	Red(2)			NtnlForest	
Existing CAROW	21	BRC	Green(3)				
Existing Easement	23		Lt. Orange(82)				
Existing LAROW	22	BRL	Red(2)				
Iron pin	52	PIPIN	White(15)	ROW	PIPIN		
Iron Pin text	53		White(15)				
Parcel number	24		Blue(94)	row	parnum		
Perm Channel Ease	47		Orange(81)			MS 0 lw=3	
Perm Drainage Ease	40	DE	Orange(81)			Filled	
Perm Easement	26	EC	Orange(81)				
Perm GRail Easement	42		Orange(81)			MS 0 lw=3	
Perm Ret Wall Ease	43		Orange(81)			MS 0 lw=3	
Perm Sewer Easement	44		Orange(81)			MS 0 lw=3	
Perm Slope Easement	41		Orange(81)			MS 0 lw=3	
Perm Utility Easement	46		Orange(81)			MS 0 lw=3	
Perm Water Easement	45		Orange(81)			MS 0 lw=3	
Property line	7	BP	White(15)			PropLine	
Proposed Bound	50	PBND	White(15)	ROW	PPBND		
Proposed CAROW	29		Green(3)				
Proposed LAROW	30		Red(2)				
Proposed ROW	28		Blue(94)			ROW lw=3	
Right-of-way line	20	BRW	Blue(94)			ROW	
ROW Chart	4		Green(3)				
State Line	56	BSL	Red(2)			StateLine	
Takes	39		Orange(81)			Hatched	
Temp Const Easement	35		Orange(81)			Filled	
Temp Detour Easement	33		Orange(81)			MS 0 lw=2	
Temp Drive Easement	32		Orange(81)			MS 0 lw=2	
Temp Erosion Easement	34		Orange(81)			MS 0 lw=2	
Town line	58	BT	Red(2)			TownLine	

DRAWING: SXX CUT SHEET

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Border	58						
Bunny Trails	63		Orange(81)			MS 1, WT 2	

DRAWING: XS CROSS SECTION

Description	Level #	MX Label	Color	Cell	Cell	Linestyle	Comment
Construction Elements	63						
Crushed Gravel Areas	23		Lt. Purple(9)				
Curb	35						
Cut Areas	26		Red(2)				
Detail Objects	10		Cell color				
Dimensions	40		Red(2)				
Existing	1						
Existing Trees	30		Green(3)				
Fill Areas	25		Brown(34)				
Gravel Areas	21		Pink(183)				
Grid text	47		Brown (16)				
Major grid	45						
Minor grid	46						
Notes	50						
Proposed	2						
Proposed Detail Objects	15		Cell color				
Proposed Trees	32		Green(3)				
Sand Areas	22		Orange(81)				
Sill	28		Red(2)		XSILLL		
Str Labels	48		Orange (7)				
Subgrade	3						
Topo Annotation	11						

APPENDIX C – MX MODEL NAMING CONVENTION

Note: These are the most commonly encountered models on a project. When creating additional models, use names that easily and accurately reflect the information contained in the model.

PLAN PREPARATION MODELS

(Models appear in approx. order of creation)

RAxxxxx Model containing a field surveyed traverse string PSSA. Traverses may be received as separate files (eg. RAxxxxx.SDR, RBxxxxx.SDR, etc. - where xxxxx is the project number). Individual traverses are typically combined to create a single traverse in this model. The Survey Section is responsible for closing/adjusting traverses.

TOPO Model containing existing project detail/topo strings as recorded in the field by survey data collectors. This model is created by editing then merging individual topo files (eg.TAxxxxx.SDR, TBxxxxx.SDR, etc. - xxxxx is the project number).

AERIAL DETAIL Model containing existing aerial survey detail obtained from an outside agency.

BOUNDARY A model containing one or more boundary strings (BDRY, BY01, etc.) Boundary strings may be used in merging models or controlling creation and trimming of the triangle string (although PBRK strings have generally superceded boundary string needs in triangulation).

TRIANGLES Model containing the triangulation string (TRIA) created by using select topo detail string information. Triangulation interrelates points on and between strings, creating a surface from which elevations can be extracted at any location.

CONTOURS Model containing the existing ground contour strings (0 [zero] = major, D = minor) created by surfacing (contouring) the TRIANGLES model.

SALIGN Model containing reference master alignments (MCxx) created using center of road shots (CO) to establish tangents and adding approximate curves (to nearest 15'). Reference alignments are used to cut profiles and cross sections which assist in verifying the accuracy of the TOPO & CONTOURS models via a field check. Existing ground elevations are attached to the master strings by sectioning them over the TRIANGLES model. Strings in this model must be refined (drive points added, etc.) if they are to be used for design purposes.

SSECT MCxx Model containing existing ground cross sections cut referencing the master string MCxx in SALIGN. Existing ground sections are cut over the TRIANGLES model at each point along the master string and assigned string labels beginning with 'E'.

Additional cross sections may be cut across select topo detail for annotation purposes (EP, TW, etc.). These are assigned a string label of 'D'. Separate section models are maintained for each unique master string.

NOTE: THESE MODELS ARE RECORD FILES! NO MODIFICATIONS ARE TO BE MADE WITHOUT THE PRIOR APPROVAL OF THE PLAN PREPARATION SECTION.

PRELIMINARY DESIGN MODELS

OG PROFILES Model storing the master strings 'MCxx' (with existing ground **or** elevations), existing ground strings 'LCxx' and original geometry

OG PALIGN strings 'GCxx'. This model is used for back up purposes. Note that drive points need to be inserted on the master string if it has not already been done. Master strings are sectioned (177 over the TRIANGLES model or 171 over a CONTOURS & DETAIL model - only if no Triangles model exists) to attach existing ground elevations, then 'L' strings created (by specifying 'Lxxx' in the 3rd field). Once these steps are complete, the 'M', 'L', and 'G' strings are copied into the PALIGN model where proposed elevations will be attached.

PALIGN Model for storing all master strings 'MCxx' with proposed elevations, geometry 'GCxx' strings containing updated vertical information and existing ground elevation strings 'OGxx'. New elevations are attached to the master strings using the VERAT option. The vertical portion of the geometry string must be updated as well. This is accomplished by specifying a second model when using the VERAT option.

Note: Master 'MC' and associated ground 'OG' strings must reside in the same model to be drawn up or plotted together.

PDESIGN MCxP This model contains the master string 'MCxP' with proposed elevations (copied from PALIGN), and the associated template and interface strings (created with DESIGN and INTERFACE options). Separate design models are maintained for each master string to minimize masking requirements when cutting cross sections.

PSECT MAXP Model containing existing, proposed, bottom of box, detail and subgrade cross sections for master string MCxP. Sections are to be labeled based on the following conventions: 'B' bottom of box, 'E' existing, 'F' proposed, 'D' detail (used for the purpose of annotating cross sections) and 'V' subgrade generated using the VOLSECT UPM. Separate cross section models are maintained for each master string. Related cross section strings must reside in a common model to allow overdraws.

For the most accurate results, existing cross sections 'E' should be cut over the TRIANGLES model. Older projects may not contain a TRIANGLES model. In this case, users need to create a model called CONTOURS & DETAIL containing the combined information of the two independent models - this will yield acceptable but less accurate results than sectioning over a TRIANGLES model.

Proposed sections 'F' are cut using the template, interface and proposed master string(s) stored in the PDESIGN MCxx model, while detail sections 'D' are cut over the TOPO model. Bottom of box sections are given a 'B' label. Subgrade sections 'V' are generated using the VOLSECT UPM and can be used to calculate preliminary cut and fill volumes.

SIGHT LINES Model intended to store sight lines for various alternates.

NOTE: THESE MODELS ARE INTENDED FOR PRELIMINARY USE ONLY AND ARE TECHNICALLY CONSIDERED 'RECORD' FILES. NO MODIFICATIONS ARE TO BE MADE WITHOUT THE APPROVAL OF THE PRELIMINARY DESIGN ENGINEER.

FINAL DESIGN MODELS

When a project is turned over, the preliminary design engineer shall provide the team with a list of the moss models and pertinent strings in each. The final team will copy the pertinent strings into the appropriate Final Design models where work will progress. Final work should not be done in Preliminary Design models.

APPENDIX D – MX DETAIL STRING LABELING CONVENTION (TOPICAL)

GENERAL USE:	
Bench mark	PBMK
Boring	PBOR
Drill hole	PDHL
Level string	L
Spot elevations	PELV
Survey traverse string	PSSA
Point labels within survey traverse string (PSSA)	
Traverse PI S	
Survey fly station P	
BOUNDARIES:	
County line	BC
Iron pin or pipe	PIPN
National forest line	BN
Project marker	PRJM
Proposed construction easement	CE
Proposed drainage easement	DE
Property line	BP
Right-of-way bound	PCON
Right-of-way, controlled access	BRC
Right-of-way, limited access	BRL
Right-of-way line	BRW
State line	BSL
State line marker	PSLM
Town line	BT
Town line marker	PTLM
ROADWAY FEATURES:	
Center of road	CO
Edge of traveled way	TW
Edge of pavement	EP
Lane markings	LM
Driveway	DR
Trail	TL
Curb - Left	CL

Curb - Right	CR
Curb - Top	TC
Beam guard rail - Left	BL
Beam guard rail - Right	BR
Cable guard rail - Left	GL
Cable guard rail - Right	GR
Double face beam guard rail	DF
Jersey barrier	JB
Ditch line	DL
Bottom of slope	BS
Top of slope	TS
BRIDGE FEATURES:	
Bridge deck	BG
Bridge abutment - Top	TB
Bridge abutment - Bottom	BB
Expansion joint	EJB
Exposed bridge footing - Top	TF
Exposed bridge footing - Bottom	BF
Obscured area of bridge (aerial surveys)	OB
Top of bridge pier	TP
Wing wall - Top	WT
Wing wall - Bottom	WB
Rip-rap	RP
Spot elevations	PEBV
Miscellaneous detail features - point string	PMBF
RAILROAD FEATURES:	
Railroad	RR
Railroad sign	PRSN
Railroad signal	PRSL
Railroad switchstand	PRSW
STRUCTURES:	
Building (outline of building on photogrammetry or sill shots for ground survey)	BD(Default,Off)
Concrete Pad (gas station island; etc.)	CP
Ground at/near building	BE
Foundation/Ruin	FD
Steps	SP
Sidewalk	SK
Fence - Barbed wire	FB
Fence - Other	FO
Retaining wall - Left ---^---^---	RWL
Retaining wall - Right ---v---v---	RWR

Retaining wall - Top	TR
UTILITIES:	
Catch basin top	PCBD
Catch basin/Drop inlet sump	PSUM
Dam	DM
Dam - bottom	DB
Drainage pipe (Survey: use IGL for dir. shots)	DP
Drop inlet top	PDID
Fire hydrant	PHYD
Gas pumps	GP
Gas shutoff	PGSO
Gate	GA
Guy pole or stub	PGUY
Guy wire anchors	PANC
Headwall, culvert end - Bottom	BH
Headwall - Top	TH
Joint power and telephone pole	PJNT
Light on joint pole	PLTJ
Light on power pole	PLTP
Light pole	PLIT
Manhole - Drainage	PMHD
Manhole - Electric	PMHE
Manhole - Gas	PMHG
Manhole - Sewer	PMHS
Manhole - Telephone	PMHT
Manhole - Water	PMHW
Pole	PPOL
Power pole	PPWR
Sluiceway	SU
Storage tanks	SG
Storage tank fill cap	PSTT
Public telephone	PBTH
Telephone/telegraph pole	PTEL
Transmission line/Aerial electric lines	AE
Transmission line tower	PPTR
Utility junction box	PJCT
Underdrain	UD
Underground Electric	UE
Underground Gas	UG
Underground Sewer	US
Underground Telephone	UT
Underground Water	UW
Water gate	PWGT
Water shutoff	PWSO
SIGNING/SIGNALS:	
Controller cabinet	PCCT

Handhole	PHHL
Loop detector	SLD
Magnetic detector sleeve	DS
Mast arm pole	PMAP
Pullbox	PPBX
Sign – Single post	PSGN
Sign - Double post	PSND
Sign - Billboard or other large sign (string feature)	SN
Signal conduit	SC
Street light conduit	LC
Traffic signal without mast arm	PSGL
OTHER GROUND FEATURES:	
Athletic Field	AF
Berm	BM
Boulder	PBDR
Bush	PBUS
Cemetery	CM
Delineated wetland	WD
Ground light/yard light	PGLT
Fire tower	PFTR
Flag pole	PFPL
Gravestone	PGRV
Hedge	HE
High water mark	HW
Intermittent or small stream	ST
Lamp post/private light pole	PLPT
Lawn features (flower beds; etc.)	ORN
Leachfield	LF
Mail box	PMBX
Miscellaneous detail features - Point string	PMDF
Miscellaneous detail features - Feature string	FM
Monuments/statues or other related items	PMON
Monuments if taken as feature strings	ON
Obscured area (aerial surveys)	OA
Orchard	ORC
Pool	QP
Post - all types	PPST
Ramp - Boat; etc.	RM
Ridge line	RD
Rock outcrop	RO
Satellite dish	PDAT
Septic Tank	PSTK
Shore line - Left	SL
Shore line - Right	SR
Stockpile/lumber pile	QS
Stone wall	SW
Stream or river flow arrow (AERIAL SURVEYS ONLY) FA	
Stump	PSTP

Swamp/marsh or wet area	WA
Swamp symbol	PSWP
Tree - Coniferous	PTCS
Tree - Deciduous	PTDS
Vent pipe - Outlet	PVNT
Waterfall	WF
Well	PWEL
Woods line or brush line - Left	WL
Woods line or brush line - Right	WR
CONTOURS:	
Index contour	0 [zero]
Intermediate contour	D
PIT SURVEYS:	
(Survey use only)	
Bottom of slope	BS
Level string	L
Limit of pit	LP
Limit of work	LW
Old ground	OG
Stockpile	SO
Top of slope	TS
Waste	WS
TEXT STRINGS:	
(Not for survey use)	
Building name	*BD
Cemetery name	*CM
County name	*CT
Dam name	*DM
General name	*GN
Miscellaneous name	*MS
Ocean name	*OC
Pipeline name	*PI
Pole numbers	*PL
Pool text	*PO
Road names	*RD
Railroad name	*RR
River name	*RV
Spot elevations	*E
State name	*ST

Town name	*TW
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APPENDIX E – MX DETAIL STRING LABELING CONVENTION (ALPHABETICAL)

*BD	Building name
*CM	Cemetery name
*CT	County name
*DM	Dam name
*E	Spot elevations
*GN	General name
*MS	Miscellaneous name
*OC	Ocean name
*PI	Pipeline name
*PL	Pole numbers
*PO	Pool text
*RD	Road names
*RR	Railroad name
*RV	River name
*ST	State name
*TW	Town name
AE	Transmission line/Aerial electric lines
AF	Athletic Field
BB	Bridge abutment - Bottom
BC	County line
BD	Building (outline of building on photogrammetry or sill shots for ground survey)
BE	Ground at/near building
BF	Exposed bridge footing - Bottom
BG	Bridge deck
BH	Headwall, culvert end - Bottom
BL	Beam guard rail - Left
BM	Berm
BN	National forest line
BP	Property line
BR	Beam guard rail - Right
BRC	Right-of-way, controlled access
BRL	Right-of-way, limited access
BRW	Right-of-way line
BS	Bottom of slope
BS	Bottom of slope
BSL	State line
BT	Town line
CA	Index contour - Approximate
CB	Index contour - Approx. depression
CD	Index contour - Depression
CE	Proposed construction easement
CL	Curb - Left
CM	Cemetery
CO	Center of road
CP	Concrete Pad (gas station island; etc.)
CR	Curb - Right
CS	Index contour - Standard

DB	Dam - bottom
DE	Proposed drainage easement
DF	Double face beam guard rail
DL	Ditch line
DM	Dam
DP	Drainage pipe (Survey: use IGL for dir. shots)
DR	Driveway
DS	Magnetic detector sleeve
EJB	Expansion joint
EP	Edge of pavement
FA	Stream or river flow arrow (AERIAL SURVEYS ONLY)
FB	Fence - Barbed wire
FD	Foundation/Ruin
FM	Miscellaneous detail features - Feature string
FO	Fence - Other
GA	Gate
GL	Cable guard rail - Left
GP	Gas pumps
GR	Cable guard rail - Right
HE	Hedge
HW	High water mark
JB	Jersey barrier
L	Level string
L	Level string
LC	Street light conduit
LF	Leachfield
LM	Lane markings
LP	Limit of pit
LW	Limit of work
OA	Obscured area (aerial surveys)
OB	Obscured area of bridge (aerial surveys)
OG	Old ground
ON	Monuments if taken as feature strings
ORC	Orchard
ORN	Lawn features (flower beds; etc.)
PANC	Guy wire anchors
PBDR	Boulder
PBMK	Bench mark
PBOR	Boring
PBTH	Public telephone
PBUS	Bush
PCBD	Catch basin top
PCCT	Controller cabinet
PCON	Right-of-way bound
PDAT	Satellite dish
PDHL	Drill hole
PDID	Drop inlet top
PEBV	Spot elevations
PELV	Spot elevations
PFPL	Flag pole
PFTR	Fire tower
PGLT	Ground light/yard light
PGRV	Gravestone

PGSO	Gas shutoff
PGUY	Guy pole or stub
PHHL	Handhole
PHYD	Fire hydrant
PIPN	Iron pin or pipe
PJCT	Utility junction box
PJNT	Joint power and telephone pole
PLIT	Light pole
PLPT	Lamp post/private light pole
PLTJ	Light on joint pole
PLTP	Light on power pole
PMAP	Mast arm pole
PMBF	Miscellaneous detail features - point string
PMBX	Mail box
PMDF	Miscellaneous detail features - Point string
PMHD	Manhole - Drainage
PMHE	Manhole - Electric
PMHG	Manhole - Gas
PMHS	Manhole - Sewer
PMHT	Manhole - Telephone
PMHW	Manhole - Water
PMON	Monuments/statues or other related items
PPBX	Pullbox
PPOL	Pole
PPST	Post - all types
PPTR	Transmission line tower
PPWR	Power pole
PRJM	Project marker
PRSL	Railroad signal
PRSN	Railroad sign
PRSW	Railroad switchstand
PSGL	Traffic signal without mast arm
PSGN	Sign - Single post
PSLM	State line marker
PSND	Sign - Double post
PSSA	Survey traverse string
PSTK	Septic Tank
PSTP	Stump
PSTT	Storage tank fill cap
PSUM	Catch basin/Drop inlet sump
PSWP	Swamp symbol
PTCS	Tree - Coniferous
PTDS	Tree - Deciduous
PTEL	Telephone/telegraph pole
PTLM	Town line marker
PVNT	Vent pipe - Outlet
PWEL	Well
PWGT	Water gate
PWSO	Water shutoff
QP	Pool
QS	Stockpile/lumber pile
RD	Ridge line
RM	Ramp - Boat; etc.

RO	Rock outcrop
RP	Rip-rap
RR	Railroad
RWL	Retaining wall - Left ---^---^---
RWR	Retaining wall - Right ---v---v---
SC	Signal conduit
SG	Storage tanks
SK	Sidewalk
SL	Shore line - Left
SLD	Loop detector
SN	Sign - Billboard or other large sign (string feature)
SO	Stockpile
SP	Steps
SR	Shore line - Right
ST	Intermittent or small stream
SU	Sluiceway
SW	Stone wall
TB	Bridge abutment - Top
TC	Curb - Top
TF	Exposed bridge footing - Top
TH	Headwall - Top
TL	Trail
TP	Top of bridge pier
TR	Retaining wall - Top
TS	Top of slope
TS	Top of slope
TW	Edge of traveled way
UD	Underdrain
UE	Underground Electric
UG	Underground Gas
US	Underground Sewer
UT	Underground Telephone
UW	Underground Water
WA	Swamp/marsh or wet area
WB	Wing wall - Bottom
WD	Delineated wetland
WF	Waterfall
WL	Woods line or brush line - Left
WR	Woods line or brush line - Right
WS	Waste
WT	Wing wall - Top
ZA	Intermediate contour - Approximate
ZB	Intermediate contour - Approx. depression
ZD	Intermediate contour - Depression
ZF	Intermediate contour - Standard

APPENDIX F – MX DESIGN STRING LABELING CONVENTION

Mainline alignment.....	MC-M
Side Road alignment.....	MC-A
Detour alignment.....	MC-B
Driveway alignment.....	MC-D
Preliminary alignment.....	MC-P
Ramp alignment.....	MC-R
Survey alignment.....	MC-S
Railroad alignment.....	MC-T
Road Center Line (Geometry).....	GC
Road Center Line (Proposed Elevations).....	LC
Road Center Line (Old Ground Elevations).....	OC
Roadway (Edge).....	CE
<i>Formerly TW</i>	
Roadway (Hard Strip).....	CS
<i>Boundary between travel lane and median</i>	
Roadway (Hinge).....	CH
<i>Used for line separating travel lane from widened section</i>	
Roadway (Curb Return).....	CR
Shoulders (Edge)	
<i>Formerly EP</i>	ES
Shoulders (Shoulder rollover).....	ER
Shoulders (Top of Curb).....	ET
Shoulders (Back of Curb).....	EB
Shoulders (Front of Sidewalk).....	EW
Shoulders (Back of Sidewalk).....	EX
Shoulders (Level Datum).....	EH
<i>Top of slope, 0.3m (1') from ES string</i>	
<i>This is the string to be used as the datum string for INTERFAC macros</i>	
Earthworks (Cut left).....	IL
<i>Formerly ICL</i>	
Earthworks (Cut right).....	IR
<i>Formerly ICR</i>	
Earthworks (Fill).....	IF
Earthworks (Front of Ditch).....	ID
Earthworks (Back of Ditch).....	IE
Earthworks (Cut Berm).....	IB
Earthworks (Fill Berm).....	IS
Earthworks (Widened area for 2:1 slopes).....	IY
Earthworks (Top of Slope).....	IZ
Earthworks (Rounding).....	R
Traffic Island ().....	TI
Traffic Island ().....	TJ
Traffic Island (Flowline).....	TF
Traffic Island (Top of Curb).....	TT
Traffic Island (Back of Curb).....	TB
Curb Return (M String).....	MR

APPENDIX G – MX ALIGNMENT DATA FORMATS (HALGN & VERAT)

HALGN

HALGN is an ASCII format that can be used to define a horizontal alignment in MX using straight and circular elements.

A maximum of 500 elements may be processed.

Single element alignments may be defined.

Sample HALGN input data

```

MOSS
EDIT, PALIGN
004, 3=MC4A
004, 3=GC4A
999
HALGN, PALIGN, PALIGN
300, LB=MC4A, SC=10000.000, CF=10000.000, CE=25.000, TL=0.500
301, 1, SX, X1=1074148.120202, Y1=386094.810662, X2=1074100.198409, Y2=386000.786026
301, 2, LE, RA=150.000000
301, 3, SX, X1=1074100.198409, Y1=386000.786026, X2=1074173.873438, Y2=385776.465497
301, 4, RE, RA=150.000000
301, 5, SX, X1=1074173.873438, Y1=385776.465497, X2=1074187.614075, Y2=385623.903222
301, 6, LE, RA=150.000000
301, 7, SX, X1=1074187.614075, Y1=385623.903222, X2=1074439.853660, Y2=384526.119739
301, 8, RE, RA=675.000000
301, 9, SX, X1=1074439.853660, Y1=384526.119739, X2=1074076.050658, Y2=384210.199307
999
    
```

Description of HALGN Format

MOSS.....	MX files begin with this line to clear any previous errors
EDIT, PALIGN	Tell MX to EDIT the model called PALIGN. For simplicity always use this model name in files generated from other design packages.
004, 3=MC4M	The 004 option tells MX to delete the string labeled MC4M if it currently exists. MX alignments are named with 4 character labels beginning with "MC". The third character is selected by the user and can be any alpha-numeric character. However, the selected character cannot be used for more than one alignment. See the Design string labeling convention on page 81 for the appropriate fourth character.
004, 3=GC4M	Delete the corresponding Geometry String. Use the label above changing the initial character to "G"

999 Tell MX to end the EDIT command
HALGN, PALIGN, PALIGN Begin the HALGN option. Include the model name twice.
300, LB=MC4M, SC=10000.000, CF=10000.000, CE=25.000, TL=0.500
Initiate the alignment.
LB = Alignment label
SC & CF are start station. These numbers should match
CE = Station interval. Typically 10 for metric projects, 25 for Imperial
TL is a curve tolerance, use 0.5
301, 1, SX, X1=1074148.120202, Y1=386094.810662, X2=1074100.198409, Y2= 386000.78602
6
Tangent and curve sections are defined using option 301. The first field after the 301 record is a sequence number beginning at 1. The following code tells the type of element; SX = Tangent, LE = Left-hand curve, RE = Right-hand curve.
X1, Y1 are coordinates at the beginning of the tangent section
X2, Y2 are coordinates at the end of the tangent section
301, 2, LE, RA=150.000000 This line creates a left-hand curve between the tangent in the line above and the one below with a radius of 150.
301, 3, SX, X1=1074100.198409, Y1=386000.786026, X2=1074173.873438, Y2=385776.46549
7
301, 4, RE, RA=150.000000
301, 5, SX, X1=1074173.873438, Y1=385776.465497, X2=1074187.614075, Y2=385623.90322
2
301, 6, LE, RA=150.000000
301, 7, SX, X1=1074187.614075, Y1=385623.903222, X2=1074439.853660, Y2=384526.11973
9
301, 8, RE, RA=675.000000
301, 9, SX, X1=1074439.853660, Y1=384526.119739, X2=1074076.050658, Y2=384210.19930
7
999

VERAT

VERAT is an ASCII format that can be used to define the vertical components of a previously created MX alignment.

Sample VERAT input data:

```
MOSS
VERAT, PALIGN, PALIGN
MC4M, 10000.000000, 10145.714000, 7=9
10000.000000, 328.220000
10003.600000, 328.097000, 0.010000
10004.800000, 328.037000, 0.010000
10010.800000, 327.867000, 0.010000
10041.000000, 327.500000, 40.000000
10095.000000, 327.875477, 30.000000
10118.624000, 329.271000, 0.010000
10135.902000, 330.756000, 0.010000
10145.714000, 331.789000
999
```

Description of VERAT Format

MOSS.....	MX files begin with this line to clear any previous errors
VERAT, PALIGN, PALIGN.....	Begin the HALGN option. Include the model name twice.
MC4M, 10000.000000, 10145.714000, 7=9	Begin the profile definition in the format: String label, start station, end station, 7=number of profile points defined
10000.000000, 328.220000	Start data – Beginning station, elevation
10003.600000, 328.097000, 0.010000	Vertical PI point – Station 100+03.6, elevation 328.097, 0.01 curve length The 0.01 curve length is used to indicate a grade break. In this case the alignment is crossing another roadway at an intersection. Station 100+03.6 is the point where the alignment crosses the edge of travelled way on the intersecting road.
10004.800000, 328.037000, 0.010000	
10010.800000, 327.867000, 0.010000	
10041.000000, 327.500000, 40.000000	this line shows a vertical curve with a length of 40 at VPI station 100+41, elevation 327.5
10095.000000, 327.870000, 30.000000	
10118.624000, 329.271000, 0.010000	
10135.902000, 330.756000, 0.010000	
10145.714000, 331.789000	End of profile station and elevation.
999	Tell MX to end the VERAT command

APPENDIX H – CONSTRUCTION REPORTS

SAMPLE ALIGNMENT REPORT (COGO STYLE)

Description of ALIGNMENT M101

```

*ELEMENT      1 TANGENT
  PBT      156+00.00          N  500908.132    E  98347.355

          DISTANCE      12.662    DIRECTION      S  49 06 45 E

  PC      156+12.66          N  500899.844    E  98356.927

*ELEMENT      2 CURVE LEFT
  PC      156+12.66          N  500899.844    E  98356.927

  PI      158+45.26          N  500747.591    E  98532.771

          RADIUS=      1909.860    DEGREE=      03 00 00
          LENGTH=      462.917    DELTA=      13 53 15
          TANGENT=      232.598    L CHORD=      461.784
          EXTERNAL=      14.112    L CH BRG=      S  56 03 22.5 E
          MID ORD=      14.008

  PT      160+75.58          N  500641.993    E  98740.017

*ELEMENT      3 TANGENT
  PT      160+75.58          N  500641.993    E  98740.017

          DISTANCE      1993.548    DIRECTION      S  63 00 00 E

  PC      180+69.13          N  499736.941    E  100516.282

*ELEMENT      4 CURVE RIGHT
  PC      180+69.13          N  499736.941    E  100516.282

  PI      182+16.20          N  499670.171    E  100647.325

          RADIUS=      2864.789    DEGREE=      02 00 00
          LENGTH=      293.889    DELTA=      05 52 40
          TANGENT=      147.073    L CHORD=      293.760
          EXTERNAL=      3.773    L CH BRG=      S  60 03 40 E
          MID ORD=      3.768

  PT      183+63.02          N  499590.333    E  100770.842

*ELEMENT      5 TANGENT
  PT      183+63.02          N  499590.333    E  100770.842

          DISTANCE      1550.624    DIRECTION      S  57 07 20 E
    
```

PAT 199+13.64 N 498748.578 E 102073.104

SAMPLE ALIGNMENT REPORT (COORDINATES)

<u>Point</u>	<u>North</u>	<u>East</u>	<u>Elevation</u>	<u>Station</u>
1	500004.15	99991.85	636.90	70100.00
2	500008.48	99994.35	637.00	70105.00
3	500010.22	99995.36	637.04	70107.01
4	500012.81	99996.85	636.99	70110.00
5	500017.14	99999.35	636.89	70115.00
6	500021.47	100001.85	636.79	70120.00
7	500025.80	100004.35	636.69	70125.00
8	500026.69	100004.86	636.67	70126.02
9	500030.13	100006.85	636.51	70130.00
10	500034.46	100009.35	636.32	70135.00
11	500038.79	100011.85	636.13	70140.00
12	500043.12	100014.35	635.95	70145.00
13	500047.45	100016.85	635.78	70150.00
14	500051.78	100019.35	635.62	70155.00
15	500052.40	100019.71	635.60	70155.72
16	500056.11	100021.85	635.47	70160.00
17	500060.45	100024.34	635.33	70165.00
18	500064.79	100026.83	635.20	70170.00
19	500069.13	100029.31	635.08	70175.00
20	500073.47	100031.79	634.97	70180.00
21	500077.82	100034.26	634.87	70185.00
22	500082.17	100036.72	634.77	70190.00
23	500086.52	100039.18	634.69	70195.00
24	500090.88	100041.63	634.61	70200.00
25	500095.24	100044.08	634.55	70205.00
26	500099.60	100046.52	634.49	70210.00
27	500103.97	100048.95	634.44	70215.00
28	500108.34	100051.38	634.41	70220.00
29	500112.71	100053.81	634.38	70225.00
30	500117.09	100056.23	634.36	70230.00
31	500121.47	100058.64	634.35	70235.00
32	500125.85	100061.04	634.35	70240.00
33	500130.24	100063.45	634.36	70245.00
34	500134.63	100065.84	634.37	70250.00
35	500139.02	100068.23	634.40	70255.00
36	500143.42	100070.61	634.44	70260.00
37	500147.81	100072.99	634.48	70265.00
38	500152.21	100075.36	634.54	70270.00
39	500156.62	100077.73	634.60	70275.00
40	500161.03	100080.09	634.66	70280.00
41	500165.44	100082.45	634.72	70285.00
42	500169.85	100084.80	634.78	70290.00
43	500174.27	100087.14	634.84	70295.00
44	500178.69	100089.48	634.90	70300.00
45	500183.11	100091.81	634.96	70305.00
46	500187.54	100094.13	635.02	70310.00
47	500191.97	100096.45	635.08	70315.00
48	500196.40	100098.77	635.14	70320.00
49	500200.83	100101.08	635.20	70325.00
50	500205.27	100103.38	635.26	70330.00
51	500209.71	100105.68	635.32	70335.00

